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LIFE SYSTEMS DIVISION

LITERATURE SURVEY OF SOLID WASTE/DISEASE RELATIONSHIPS

VOL. V – ANNOTATED BIBLIOGRAPHY, PART 4

FINAL REPORT TO

OFFICE OF SOLID WASTES
UNITED STATES PUBLIC HEALTH SERVICE

CONTRACT PH 86-66-151

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LITERATURE SURVEY OF SOLID WASTE/DISEASE RELATIONSHIPS

VOL. V - ANNOTATED BIBLIOGRAPHY, PART 4

By T. G. HANKS, M. D.

Final Report To

DEPARTMENT OF HEALTH, EDUCATION, AND WELFARE
BUREAU OF STATE SERVICES
UNITED STATES PUBLIC HEALTH SERVICE
OFFICE OF SOLID WASTES

Contract PH 86-66-151

Report No. 3337 January 1967

AEROJET-GENERAL CORPORATION
A SUBSIDIARY OF THE GENERAL TIRE & RUBBER COMPANY

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Disease/Solid Waste Abstracts

No. DSW- 570

Author A.K. Krishnaswami, B.S. Krishnamurthy and S. N. Ray

Title

Investigations on Plague in Kolar District (Mysore State)

Reference

Indian Journal of Malariology

Doc. No. **Contract No.** **Date issued**

17, 2-3; pgs.179-82 June-Sept. 1963

Abstract

A team from the National Institute of Communicable Diseases was deputed in December, 1962, to help the Mysore State Government to investigate plague situation in Kolar District and plan control measures. The team worked in the area from December, 1962 to April, 1963, and studied the epidemiology of the disease, the rodents (chiefly domestic) and the rat-flea fauna in the district. It was obvious that plague was persisting in Koar District, and the incidence of human cases had been progressively on the increase since 1960.

Monthly data on the morbidity and mortality due to plauge are presented. Transmission appears to be in progress almost during all the months though the intensity shows wide variations. The higher incidence of cases among females can probably be explained on the ground that they remain indoor for a greater time and thereby the risk of exposure is definitely enhanced.

A large number of rats, collected during the investigations, were subjected to bacteriological examination. No macroscopic pathological changes were observed in any Some of the fleas collected from the trapped rats were polled and sent up for bacteriological examination. Twenty such flea pools, each containing from one to ninety fleas, were subjected to bacteriological examination. One of the collections (30 fleas) yielded positive result, and P. pestis was isolated.

The reappearance of human plague in some parts of the country, after varying periods of absence, has indicated that the mere freedom from human cases of plague in any area is no matter for complacence. The development of events in areas like Kolar have shown that plague can remain dormant over a number of years, only to flare up again and spread in the community with the return of favorable conditions.

Descriptors

plague
control
epidemiology
rodents
rat-flea fauna
fleas
terrain
topography
history
incidence
human cases
domestic rodent
reservoir
infection
sex
age incidence
bacteriological investigations
P. pestis
epidemiological chain
disease
colony infection
commensal
DDT
transmission
control
rodent control
education

2<

Abstract (continued)

Baltazard et al. (1958), following their observations in Uttar Pradesh, concluded that plague was not static there but was constantly shifting from one place to another through continguity of colony infection amonst wild rodents, which eventually transferred the infection to the commensal rats on their path. This resulted in epizootics amonst the commensal rats in the villages, which were often followed by human cases.

The observations recorded during the present investigations showed some evidence regarding the possibility of the infection originating from the sylvatic reservoir(s). The total absence of infection among the 576 domestic rats examined also indicated that the reservoir had to be looked for elsewhere.

The temporary lull in the incidence of plague in Kolar District can partly be attributed to the use of DDT over the entire district under the National Malaria Eradication Programme. It was observed that the fleas were resistant to DDT and the transmission which had re-established even when the DDT spraying was in progress, became more intense with the withdrawal of DDT since 1962.

The early success of DDT in keeping the transmission of plague under control till about 1959 led to the abandoning of any semblance of routine anti-rodent measures in Kolar as well as in most other parts of the country (excepting Madras State) where such an organisation existed in the past. There seems to be little justification for such a step, even if the belief that the plague situation had been brought under control had been well founded. It is essential that persistent and sustained measures be started and maintained for the destruction of rats. The only hope lies in the implementation of rodent control measures on a community-wide scale.

A great deal of organised and co-ordinated effort is necessary to enlist the cooperation of the masses in the rodent control operations which have to be maintained on a sustained basis. Spasmodic efforts are wasteful.

Disease/Solid Waste
Abstracts

No. DSW- 571

Author

Beryl J. Rosenstein

Title

Shigella and Salmonella Enteritis
In Infants and Children

Reference

Johns Hopkins Hospital, Baltimore Bulletin

Doc. No.	Contract No.	Date issued
115:407-15		Nov 1964

Abstract

Diarrhea continues to be an important cause of morbidity and mortality in infants and children. While the majority of cases are not of specific bacterial origin a large number of children with shigella and salmonella enteritis continue to be seen at the Harriet Lane Home. The present report is a retrospective clinical and bacteriologic analysis of 692 children with diarrhea seen at the Harriet Lane Home from 1960 to 1964.

One of the purposes of this study was to ascertain any clinical differences between those patients with a specific bacterial enteritis and those fro whom no pathogens were cultured. Although there was overlap between these groups, the presence of high fever and/or bloody stools was more characterisitic of those pateients with a specific bacterial enteritis. Another useful differential point was the higher incidence of seizures in the shigella patients. An interesting finding was the high incidence of underlying or concurrent illness in the salmonella patients.

Children under severn years of age, with a high temperature and a past history of seizures are most likely to have a seizure with shigellosis.

Descriptors

diarrhea
morbidity
mortality
infants
children
shigella
salmonella
enteritis
retrospective clinical and bacteriologic analysis
bacterial enteritis
concurrent illness
temperature
seizure

Disease/Solid Waste
Abstracts

No. DSW- 572

Author T.H.G. Aitken, W.G.Downs,
L. Spence and A.H. Jonkers

Title

St. Louis Encephalitis Virus Isolations
in Trinidad, West Indies, 1953-1962.

Reference

Am. Jour. of Tropical Med. & Hygiene

Doc. No.	Contract No.	Date issued
13(3):450-451		1964

Abstract

In summary, over the past 9.5 years, there have been 19 isolations of St. Louis encephalitis virus in Trinidad. These have been spread out as follows: 1955, three isolations; 1956, one; 1958, seven; 1960, seven; and 1962, one. One virus strain came from a human being, five came from five species of birds, and 13 came from nine species of mosquitoes.

Descriptors

St. Louis encephalitis
virus
strain
human being
birds
species
mosquitoes

Disease/Solid Waste
Abstracts

No. DSW- 573

Author

Georges Girard

Title

Plague

Reference

Ann. Rev. Microbiol.

Doc. No.	**Contract No.**	**Date issued**
V.9:253-76		1955

Abstract

The Etiological Agent--The causative agent of plague was for a long time considered as a homogeneous species. Present-day investigations have led to the notion that there are three biological varieties of *P. pestis*, each of which is found in a particular part of the world.

Berlin and Borzenkov first distinguished two types of *P. pestis*: one, continental, glycerol-positive; the other oceanic, glycerol-negative. The continental type seems to have been the causative agent in the ancient pestilence centers of Southeast Russia, Central Asia, Mongolia, Manchuria, the Transbaikal area, and Central Africa, in which the organism was perpetuated through wild rodents. The oceanic type provoked the modern pandemia which, originating in Yunnan in 1894, spread over the seas into the five continents, the rat and its fleas having been the original and subsequent agents of transmission. This is the only type known in Europe, the United States, South America, Ceylon, Egypt, India, Indo-China, Java, North Africa, Senegal, Sumatra, Thailand, and Madagascar. The continental type of *P. pestis* is itself divided into two sub-types, according to whether or not the culture reduces nitrates to nitrites.

The notion of a reservoir of plague infection was for a long time limited to domestic rats, but it has been progressively extended to include an ever-growing list of rodent species susceptible to natural plague or found to be carriers of infected fleas. One counts now 186 species of these rodents, and to this must still be added 14 species of *Leporidge* as well as some carnivores, insectivores, marsupials, and primates. (69) Likewise, entomologists have sought to penetrate more intimately the relationship between ecological conditions and the biology of plague-bearing fleas which constitute also, in association with rodents, disease reservoirs. But let us not forget that since 1894, in all places where bubonic

Descriptors

plague
Pasteurella pestis
continental type
pestilence centers
wild rodents
oceanic type
pandemia
rat
fleas
sub-types
growth
nutritive requirements
variants
mutation process

dissociation
pathogenicity
virulence
toxicity
viability
Xenopsylla cheopis
metabolism
bacteriophage action
immunology
reservoir
infection
domestic rats
endemic foci
attenuated organisms

Leporidae
carnivores
insectivores
marsupials
primates
disease
Rattus rattus
R. norvegicus
epidemic
Meriones
ectoparasites
Pulex irritans
rural sectors

phrphylaxis
control
periodic revivals
sylvatic plague
commensal rodents
vaccination
therapeutics
pestilence curve
endemic foci
rural sectors
under-developed countries
cyclic behavior of plague

Abstract (continued)

plague has raged or is presently raging, one has found without exception the domestic rat *Rattus rattus* or *R. norvegicus* and the plague-bearing flea most dangerous to man, *Xenopsylla cheopis*. This combination is responsible for epidemic manifestations in India, Java, Madagascar, Egypt, Senegal, Kenya, Peru, Brazil and elsewhere. On the other hand, an important disease reservoir may exist and perpetuate itself in a country without notable repercussions in man if the rat does not participate in the process. This is the case in the western part of the United States of America.

Should the rat always be considered as a reservoir of plague infection?--This is the question raised and discussed by Baltazard, et al. (70,71) from evidence gathered during a small epidemic of plague which occurred in 1947 in Iranian Kurdistan. A general investigation revealed that in those sectors of the country where one suspected the existence of a former focus of plague which had led to outbreaks in the population in 1867, an episode of pneumonic plague attracted attention in the same villages 60 years later. Rats were unknown there and one found only wild rodents, notably *Meriones* which were shown to be infected with plague. In this species, the disease does not take the form of an epizootic; experimental infection reveals a marked degree of resistance (72). Under natural conditions, the invection assumes the aspect of a permanent enzootic, latent, or inapparent pestilence, nevertheless capable of evolving into acute mortal plague under conditions which are still obscure. As to the fleas associated with the rodents in Kurdistan, they are peculiar to the wild rodents, but can bite man; 60 per cent are of the genus *Xenopsylla*. For 30 years, murine plague has been of an enzootic character on the plateaus of Madagascar where the infection has not ceased to strike both man and rat.

Plague affecting *Citellus* in California appears to be secondary to murine plague imported at the end of the last century because the strains are of the oceanic type. It constitutes a disease reservoir independent of the rat, which behaves like that of the merions in Iran.

Man and human ectoparasites in the epidemiological complex. For the classic symbol "Rat-Man," representing the transmission of the plague to man only by the fleas of rats, is substituted a four link chain, "Rat-Man-Man-Rat," in which man infected first by a rat's fleas can in turn infect his habitual ectoparasites (fleas and lice) or occasionally *X. cheopis*, the latter being capable of reinfecting the rat.

In India, and wherever it has been possible to control insects with the desired means, *X. cheopis* has been almost completely exterminated with the subsequent disappearance of human and murine infection. Control of rats remains a measure of secondary urgency in time of epidemics and is a perennial concern in the latent periods. This project meets with serious difficulties, especially in rural sectors of relatively unevolved countries, and it is precisely there that plague is firmly rooted and undergoes periodic revivals. As to control of wild rodents, one should not be lulled by illusions; it will produce only aleatory results. The method to be followed has been discerningly decreed by Davis (101): locate and keep under close surveillance the centers of sylvatic plague in order to prevent transmission of the infection to commensal rodents and to human beings living in the area.

Abstract (continued)

Prospects for the future--The modern pandemia is declining. The pestilence curve shows some peaks which remind us that in many parts of the world aggressive disease sources still persist. Not the least important acievement of recent work has been to expose the importance of the reservoir represented by wild rodents. But the facts give evidence that this "wild" plague does not directly menace man as long as commensal rodents are not affected. If the rat does not constitute an independent reservoir of plague infection, the major preoccupation in territories affected with this "wild" plague should be to eliminate the passage of the bacillus to the rat. This, for example, is the present situation in the western part of the United States of America.

As to the problem of human plague, it amounts essentially to a question of habitation. It is practically solved in countries of advanced civilization henceforth secure from the great epidemics. The 20th century pandemia has nevertheless branched out to new endemic foci of which certain ones in America, Africa, and Madagascar appear to be rather permanent. With the development of means of rapid transportation, should the slightest negligence intervene in the execution of international sanitary police measures, plague could be introduced into all parts of the world; but it would quickly be conquered by the prophylactic and therapeutic measures at our disposal. Such was the case in Paris in 1919, and in Corsica, Naples, Malta, Palestine, and elsewhere in the last decade. The situation is different in rural sectors of under-developed countries. Modern authors tend to see fluctuations of rodent populations as the reason for cyclic behavior of plague.

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Disease/Solid Waste
Abstracts

No. DSW- 574

Author Edward Nichols, Mila E. Rindge and G. Gardiner Russell

Title The Relationship of the Habits of the House Mouse and the Mouse Mite (Allodermanyssus Sanguineus) to the Spread of Rickettsialpox

Reference

Ann. Internal. Med.

Doc. No.	**Contract No.**	**Date issued**
V.39:92-102		1953

Abstract

Under normal circumstances it can be assumed, on the basis of his enormous capacity for reproduction, that a mouse-infested environment is saturated with mice up to the limits of available food and harborage. These observations indicated that the house mouse was essentially a stay-at-home. Once a mouse settles down and establishes a territory it usually, though not always, remains there for life. Although mice have been observed to live out their respective lives in a single bag of grain, where a sudden shift in the ratio of available food makes conditions for survival critical, ranges of activity of surprising extent have been noted. In one instance nightly excursions of house mice into wheat-seeded fields and their retirement by day to buildings and hedgerows nearly half a mile distant were observed.[9]

Data obtained from a survey of rodent ectoparasites in New York City revealed a direct correlation in house mice between the presence of specific antibodies to Rickettsialpox and infestations by *A. sanguineus*. The relative scattering of cases in the poorer slum sections of Manhattan and the Bronx, when compared with the greater number and concentration of cases in the middle and upper income areas is interesting. That this disease should enjoy a lower level of activity where both wall-to-wall housing and population density are at their peak presents something of a paradox. The solution appears to rest largely in the character and tastes of the Norwegian rat. In these areas, where efforts at sanitation enjoy minimal if any success, this natural enemy of the mouse has settled down happily amidst a profusion of garbage and litter, and established his domain. It is from these sections that over 300 rat bites are reported yearly.[11] Mice exist in these areas but in much smaller numbers. The unfriendly relationship between rats and mice is nicely illustrated by the results of rodent

Descriptors

ecology
Rickettsialpox
Rickettsia akari
mite
Allodermanyssus sanguineus
disease
house mouse
reproduction
food
harborage
range
territory
rodent
ectoparasites
antibodies
slum sections
population density
Norwegian rat
sanitation
enemy
300 rat bites
dwellings
rats
incinerators
radiators
parasite
garbage
income

Abstract (continued)

trapping surveys which have been made in and about the dwellings from which cases of Rickettsialpox were reported.[11] In 1,800 premises investigated, rats and mice were trapped in conjunction in only six instances.

The mouse mite, *A. sanguineus*, has been recovered in a number of localities in the United States. Harboring *R. akari* does not appear to have an unfavorable effect on the mite. At Key Gardens they were found in large numbers on the walls of incinerators in the basements of the apartments and in the vicinity of mouse nests and runs. In the apartments the mites were found on the walls and baseboards in the warm proximity of radiators, as well as on ceiling light fixtures.[14]

A. sanguineus is a temporary parasite. Parasite counts have shown a a range of from one to 10 mites per mouse, with an average of four.[13,14] The fact that the incinerators were fired each morning around 7:30 a.m. made all of the garbage from the three daily meals available to the mice throughout the night and most of the day. At the time of the outbreak the outer walls of the incinerators were found to be covered with mites, unfed or engorged.

Rickettsialpox at present enjoys its widest distribution and greatest activity in the middle and upper income areas, where the density of housing is greatest, less in rat-infested slums, and least of all in those parts of the city where separated, smaller living units prevail.

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[11] Personal communication from Clinton A. Garvin, Borough Chief of Manhattan, New York City Department of Health.

[13] Personal communication from Henry S. Fuller, M.D. Assistant Professor of Microbiology, Harvard School of Public Health.

[14] Personal communication from William L. Jellison, Parasitologist, National Microbiological Institute, Rocky Mountain Laboratory, Hamilton, Montana.

Disease/Solid Waste
Abstracts

No. DSW- 575

Author

Henry Beye, Charles Brooks, and Elizabeth Guinn

Title

Protozoan and Helminthic Infestations Among Migratory Agricultural Workers

Reference

Am. Journal of Public Health

Doc. No.	Contract No.	Date issued
V.51:1862-71		Dec.1961

Abstract

According to Axelrod,[6] there are 56 major areas in the United States requiring agricultural migratory labor. These areas are located in 44 of the 48 continental states and involve about 1,000 of the 3,070 counties in the United States.

Petry and Johnston write[8] that these workers comprise about 7 per cent of the total farm labor force and are employed by 3 per cent of the farms.

A consideration of health hazards associated with such a large and complicated phenomenon as this migration must be based on epidemiologic and endemiologic information concerning a large number of disease producing agents. Unfortunately, this type of information is largely unobtainable.

The Parasite Reservoir--Direct information on this subject is very meager. The report of the Migrant Health Project of the Lower Snake River, Idaho,[9] contains direct information of the prevalence of protozoa and helminth infections among agricultural migrants. Four hundred and eighty-four single stool specimens were examined from Spanish speaking children under 15 years of age. Among these, 206, or 42.6 per cent, revealed intestinal parasites. Supplementary information in Fresno County, Calif., by Watt[10] and co-workers revealed 6.1 per cent of rectal swab cultures in children living in migratory camps to be positive for the genus Shigella. Stool studies of 56 preschool Puerto Rican children born in Puerto Rico but living in Philadelphia are [illegible] follows: E. histolytica 3.6 per cent, hookworm 7.1 per cent, A. lumbricoides [illegible] per cent, E. coli 10.7 per cent, T. trichiura 53.6 per cent, G. lamblia [illegible] per cent, E. nana 1.8 per cent, Chilomastix mesnili 1.8 per cent. It is of interest that the prevalence of intestinal parasites in 100 Puerto Ricans born in the United States was considerably less.

There would be general agreement that the parasite reservoir of the domestic and foreign agricultural migrants is large.

Descriptors

agricultural laborers
parasites
public health
Entamoeba histolytica
microfilariae
intestinal parasitism
hookworm
Endolimax nana
Trichuris trichiura
Entamoeba coli
Giardia lamblia
Strongyloides
Iodamoeba butschlii
Ascaris lumbricoides
malaria
filariasis
migratory labor
domestic migrants
health hazards
parasite reservoir
protozoa
helminth
agricultural migrants
Shigella
Schistosoma mansoni
foreign agricultural migrants
W. bancrofti
M. Ozzardi
virus infectious agents
labor camp areas
consumer population
sanitary control
contamination
water processing
food processing
infection
Schistosomiasis
vector snails
mosquito vectors
bacteria
disease
prevalence
resident population
indigeous malaria
Anopheles Freeborni
vivax malaria

Abstract (continued)

Importation of Species of Parasites New to the United States Resident Population--The Snake River report lists the diagnosis of two cases of malaria; we found four British West Indians infected with W. bancrofti, of whom one was also infected with M. ozzardi; and the importation of S. mansoni with the Puerto Rican population is well documented. The list of potential protozoan, helminthic, bacterial, and virus infectious agents could be made large--including such possibilities as Chagas' disease and yellow fever.

Actual or Potential Health Hazards--The resident population at risk comprise (1) those closely associated with the labor camp areas, and (2) the larger consumer population potentially at risk because of a possible breakdown in sanitary control in some process especially vulnerable to the effects of contamination, such as water or food processing.

W. bancrofti was once prevalent around Charleston, S. C.[16] presumably brought from Africa by the slave "migration." The most universal mosquito vector, Culex quinquefasciatus, is prevalent in many parts of the United States. The establishment of new foci in the United States, however, would probably take a number of years to become manifest. It is questionable that under present standards of sanitation and mosquito control in the United States that the disease would become apparent. Nevertheless, the potentialities exist.

Schistosomiasis--S. mansoni among the Puerto Ricans and other migratory workers from endemic areas pose special potential hazards. Suitable vector snails have been reported from Louisiana by Cram, et al.[17]

Malaria--The finding of two cases of malaria in the Snake River survey and of seven cases in California indicates the potential hazard of this well known parasite which was widely prevalent in the United States in the early part of the 20th century. Suitable mosquito vecotrs are still prevalent in some parts of the United States.

The possible hazard associated with frozen foods, picked and processed by infected individuals, has not been studied for intestinal protozoa and helminths, although a considerable literature exists concerning bacter. The practice of packing iced vegetables in the field for immediate shipment throughout the United States may present one method of dissemination.

The author could find no documented report in the literature of any sizable epidemic or increase in prevalence among a resident population traceable to agricultural migratory workers.

Dunn and Brody[18] in a review of malaria surveillance in the United States, 1956-1957, document three cases of primary indigenous malaria in Sacramento County in 1956, possibly associated with the importation of the parasite by Mexican agricultural workers in the immediate area.

Anopheles freeborni were present in moderate numbers. The same authors discuss four cases, three confirmed as vivax malaria in Sutter County, Calif. Three were neighbors on a ranch. A. freeborni were present. A farm labor camp for Mexican nationals was located about a quater of a mile from the ranch where the cases occurred, but it was not demonstrated that anyone in the camp was the source of the infection.

Summary: 1. A stool survey of 140 British West Indies agricultural workers in Clewiston, Flas., revealed the following prevalence rates for intestinal

Abstract (continued)

parasites: hookworm 54.3 per cent, E. nana 42.9 per cent, T. trichiura 33.8 per cent, E. coli 25.8 per cent, G. lamblia 13.8 per cent, E. histolytica 12.0 per cent, Strongyloides 10.4 per cent, I. butschlii 6.4 per cent, and A. lumbricoides 4.9 per cent.

2. Examination of 470 British West Indies agricultural workers revealed microfilariae of W. bancrofti in four individuals. One of these individuals was also infected with M. ozzardi.

3. These findings were reviewed in terms of (A) parasitism among migratory agricultural workers, and (b) filariasis in the Caribbean area.

Migratory agricultural workers number 1.25 million individuals, approximately one-half nationals from outside the United States and one-half workers from the southern states. A population of this size may present public health hazards with respect to protoxoan and helminthic infestations and diseases. The review of this subject attempted to gain information on the following questions: (a) What is the parasite reservoir among agricultural migrants? (b) Are migrants importing species of parasites new to the present U. S. population? (c) Are there actual or potential health hazards? (d) Are there instances of transmission from the migrant to the resident population and vice versa? Clear answers could not be obtained to these questions. There is documentation of the importation of S. mansoni, filarial infections, and probably malaria. The possible transmission of parasites by citizens born in the United States--domestic migrants--should not be overlooked.

Workers in this area believe that the possibilities of contact between the domestic migrant and the local resident are actually greater than between the foreign worker and the local resident. Although there are as yet no documented instances of greatly increased transmission of protozoa and helminths associated with agricultural migration, this does not mean that increased transmission is not occurring. It could reasonably reflect that few are looking for signs of infection, and the disease is not yet manifest.

The finding of W. bancrofti and M. ozzardi among the British West Indians from St. Kitts, Antigua, and the Barbados indicates the parasites are present on these islands.

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Disease/Solid Waste
Abstracts

No. DSW- 576

Author

J. W. Clark and W. Viessman, Jr.

Title

Water Supply and Pollution Control

Reference

International Textbook Co.

Doc. No.	**Contract No.**	**Date issued**
pp. 53		1965

Abstract

Groundwater--Sewage and industrial wastes entering an aquifer are major sources of organic and inorganic pollution. Large-scale organic pollution of groundwaters is infrequent, however, since significant quantities of organic wastes usually cannot be easily introduced underground. The problem is quite different with inorganic solutions, since these move easily through the soil and once introduced are removed only with great difficulty. In addition, the effects of such pollution may continue for indefinite periods since natural dilution is slow, and artificial flushing or treatment is generally impractical or too expensive. The number of harmful enteric organisms is generally reduced to tolerable levels by the percolation of water through 6 or 7 ft of fine-grained soil.[5]

Considerable care should be exercised to protect groundwater storage capacity from irreparable harm through the disposal of waste materials.[6]

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[6] L. Koenig, "Disposal of Saline Water Conversion Brines--An Orientation Study." U.S. Office Saline Water, Saline Water Res. Develop. Progr. Rept. No. 20 (1958).

Descriptors

groundwater
industrial wastes
aquifer
pollution
organic pollution
organic wastes
inorganic solutions
soil
dilution
flushing
enteric organisms
percolation
salts
saline contaminants
storage
disposal

No. DSW- 577

Author

John H. Dingle, et al

Title

Water Composition and Cardiovascular Health

Reference

Illinois Medical Journal

Doc. No.	**Contract No.**	**Date issued**
V.125, No. 1, p. 25		Jan.1964

Abstract

Because of the vital role wholesome water plays in public health, The Educational and Scientific Foundation of the Illinois State Medical Society accepted the request from the Water Conditioning Research Council to pose, to a panel of experts, the question: Is there a relationship between dissolved inorganic constituents of drinking water and cardiovascular disease?

They invited six scientists, oriented to various aspects of the problem, to study the subject and prepare a statement of group opinion. The panel was asked to consider also whether or not research in this field seemed to be indicated, and if so, to suggest the direction it might take.

Conclusion--The panel has concluded on the basis of available data that no causal relationship has been established between the total dissolved inorganic constituents of drinking water and cardiovascular disease. It is abundantly evident that the minor constituents of food, water and the air are capable of influencing human physiology most profoundly. Well known examples include iron in anemia, iodine in goiter, and fluorine in dental decay. The concentration of inorganic constituents is much greater in foods than in water, but the sum total of the constituents make all sources important.

Further work on the potential role of inorganic constituents of water on cardiovascular disease, if undertaken, should involve the study of comparable populations in which the water supply with respect to one or more given constituents is controlled. The length of time an individual is on a given water supply must also be taken into consideration. Uniform criteria for diagnosis must be established, and the study must be continued over a period of years in order to obtain a definite answer.

Descriptors

water composition
cardiovascular health
inorganic constituents
drinking water
cardiovascular disease
causal relationship

Disease/Solid Waste
Abstracts

No. DSW- 578

Author

David L. Muss

Title

Relationship Between Water Quality and Deaths from Cardiovascular Disease

Reference

Jrl. Am. Water Works Association

Doc. No.	**Contract No.**	**Date issued**
V. 54:1371		1962

Abstract

The 1961 USPHS Drinking Water Standards propose mandatory limits on such substances as arsenic, barium, cadmium, hexavalent chromium, cyanide, fluoride, lead, selenium, and silver.[1] Recommendations of other agencies and users specify limits for sodium, calcium, magnesium, iron, copper, and other constituents depending upon the use of the water. Although hardness is not mentioned specifically as such in the USPHS Standards, the limits of 500 ppm for total dissolved solids does, in effect, set a recommended upper limit on the total mineral content of water supplies.

In complete contrast to the trend to produce a low hardness-low alkalinity water for the sonsumer, there has come a series of reports associating water quality with deaths from cardiovascular disease. The reports were written by Kobayashi in 1957 and 1960 in Japan;[2,3] Schroeder in 1958 and 1960[4-6] and Sauer and Enterline in 1959 in the United States;[7] and Morris, Crawford, and Heady in 1961 in Great Britain.[8] In each case, the higher-quality (that is, lower-hardness or lower-alkalinity) waters were associated with higher cardiovascular death rates.

By regression analysis of 1949-51 data with average hardness varying from 17 to 299 ppm, the author has established the statistical significance of the relationship between water hardness and the death rate of white males aged 45-64 to be greater than 99.9 per cent. The death rate for zero hardness water has been determined as 905.50 persons aged 45-64 per 100,000 with a reduction of 91.60 per 100,000 for each 100-ppm increase in hardness. It therefore appears, both on a national as well as on a local scale, that the presence of calcium or magnesium--or other substances normally present or absent when calcium or magnesium is present--are responsible for substantial reductions in the death rates from cardiovascular disease.

Descriptors

waste water
deaths
cardiovascular disease
hardness
alkalinity
water
regression analysis
average hardness
death rate
calcium
magnesium

Abstract (continued)

Conclusions: Although the studies presented by the author and others involve test periods of short duration and present certain statistical limitations, the preponderance of data indicating a relationship between cardiovascular death rates and water quality appears to make this a very fruitful area for further research. Particular emphasis must, of course, be devoted to determining the magnitudes and long-term health effects of the various trace elements in waters.

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Disease/Solid Waste
Abstracts

No. DSW- 579

Author

Jun Kobayashi

Title

On Geographical Relationship Between the Chemical Nature of River Water and Death-Rate from Apoplexy (Preliminary Report)

Reference

Berichte d. Ohara Instituts

Doc. No.	**Contract No.**	**Date issued**
Bd.11,Ht.1;12-21		1957

Abstract

Japan may be called an apoplexy country. The death-rate from apoplexy in Japan, compared with those in U.S.A., Britain and Germany, is extraordinary high; it is 4-8 times and 3-6 times as high for forty-agers and fifty-agers, respectively. There is a marked difference in different parts of Japan. The writer has made clear the chemical nature of more than 600 important rivers in Japan. In this study the writer found out the fact that there is a close relationship between the chemical compositions of river water and the death-rate from apoplexy.

The rivers in our country are characterized by scantiness of calcium carbonate, i.e. alkalinity. And in some districts of eastern Japan, there are many rivers containing larger quantity of sulfate or sulfuric acid (acid substance) than carbonate (alkaline substance). This is apparently due to the volcanic sulfur-rich nature of the ground in our country. Sulfur contained in sulfur-springs, sulfide ores and in the soil is oxidized to sulfuric acid, which causes the sulfate-rich but carbonate-poor character of the river water.

Comparing the geographical distribution of rivers of abnormal-type in Japan with that of death-rate from apoplexy, the writer is aware of the fact that there exists a close relationship between the both cases. Akita Prefecture ranks atop with respect to the ratio of sulfate to carbonate, and next come Iwate, Aomori, Miyagi and Jamagata Prefectures. On the other hand, the ratios are generally low in the Prefectures of western Japan. This suggests us that a high correlation exists between the death-rate indices from apoplexy and the ratio of sulfate to carbonate in river water.

It is apparently premature to conclude from this that higher contents of sulfuric acid or sulfate in river water as compared with alkaline substance (calcium carbonate) should cause apoplexy.

Descriptors

apoplexy
death-rate
geographical difference
chemical compositions
river water
calcium carbonate
alkalinity
sulfate
sulfuric
acid substance
sulfur
sulfur-springs
sulfide
soil

Disease/Solid Waste
Abstracts

No. DSW- 580

Author

Claude E. ZoBell

Title

Marine Microbiology; A Monograph on Hydrobacteriology

Reference

Chronica Botanic Company, Walthan, Mass.

Doc. No.	**Contract No.**	**Date issued**
		1946

Abstract

The sea does present certain problems of interest to sanitary engineers and students of public health. Outbreaks of oyster-borne typhoid and the development of beaches for recreational purposes have focussed attention upon some of these problems in recent years. The problems are of acute interest to those municipalities discharging raw or partially treated wastes into oceans, bays, or estuaries.

Human pathogens in sea water:--It is the consensus that there are no autochthonous marine bacteria which infect man, but the literature is replete with contradictory accounts of the viability of adventitious pathogens in sea water. Some workers hold that sea water is highly lethal for bacteria from land-dwelling animals while other workers present data which indicate that such bacteria can live almost indefinitely in the sea.

Large numbers of coliform bacteria are introduced in the sea by land drainage, particularly in raw and partially treated sewage. It is estimated from data given by Warren and Rawn (1938) that enough coliform bacteria are discharged by sewage effluents along the west coast of the United States each day to give over a hundred for every liter of water in the North Pacific Ocean, if evenly distributed. However, such organisms are found only in tide water, harbors, and bays, which are often badly polluted.

Extensive surveys around the Hyperion outfall shows the rapidity with which coliform bacteria succumb in the sea. This outfall carries raw sewage from nearly two million inhabitants of Los Angeles a mile into the ocean. As may be expected, millions of coliform bacteria per ml. are often found near the sewer outlet. The number decreases with distance from the outlet much more rapidly than can be accounted for by dilution. Surveys, summarized by Knowlton (1929), indicate that even during onshore winds and currents the count is often less than 10 coliform

Descriptors

sanitary aspects
msrine microbiology
sea
public health
oyster-borne typhoid
wastes
oceans
bays
estuaries
human pathogens
sea water
survival of bacteria
coliform bacteria
sewage
Escherichia coli
solids
greases
shellfish
oysters
clams
mussels
Asiatic cholera
diarrhoea
gastroenteritis
Eberthella typhosa

Abstract (continued)

bacteria per ml. in the surf. As many or more Escherichia coli may be introduced by bathers on the beach. Under no conditions were coliform bacteria traced more than a mile or two from sewer outfalls in the open ocean. The effect of air currents, water movements, composition of the sewage, and other factors which influence the distribution of E. coli were considered by a commission appointed by the California State Bureau of Sanitary Engineering (1943). Only in solids or greases were coliform bacteria found to be able to survive for long periods of time in the sea. Similar observations were made in Europe.

The intestinal contents of sea fowls are generally reported to be free from coliform bacteria except in certain cases where there is evidence that the fowls have been feeding in polluted waters. Little is known regarding the intestinal flora of marine mammals. E. coli does not appear to be a normal inhabitant of the intestines of seals in captivity. Although epidemics of these gastro-intestinal diseases have never been traced to bathing beaches, outbreaks of typhoid have been traced to infected oysters.

Bacteriology of shellfish:--Oysters, clams, and mussels are often eaten raw or in a partially cooked condition. As a result, numerous cases of typhoid fever and Asiatic cholera have been traced to the ingestion of contaminated shellfish. Though normally free from dangerous gacteria in clean water, the pollution of bays and estuaries with unpurified sewage renders shellfish a potential source of infection. According to Prescott and Winslow (1931) who reviewed the literature on this subject, "In practically all of the American epidemics which have been traced to shellfish, it was demonstrated that the oysters which caused the outbreak had been 'floated' or 'fattened' in brackish water near the mouths of polluted streams." Rigorous control measures have done much to lessen the incidence of shellfish-borne diseases during the last two or three decades. Such diseases as cholera, diarrhoea, and gastroenteritis also may be transmitted by shellfish (Tanner, 1944). Several instances of the demonstration of typhoid bacilli in shellfish are related by Hunter and Harrison (1928). Dodgson (1928) gives experimental evidence that Eberthella typhosa survived in oysters, mussels, and other shellfish in sea water for more than three weeks. He cites several epidemiological instances of the prolonged survival of cirulent typhoid bacilli in mussels and oysters.

Disease/Solid Waste Abstracts

No. DSW- 581

Author

K. F. Meyer

Title

Evolution of the Problems of Occupational Diseases Acquired from Animals

Reference

Industrial Medicine and Surgery

Doc. No.	**Contract No.**	**Date issued**
V.33:286-95		May 1964

Abstract

Looking at infectious diseases as they affect man, one regards the organisms that cause them as enemies. They can destroy our health for short or long periods, even our lives; they can destroy our animals and our prosperity that results from the marketing of healthy animals and their products. When we are aware of these infections at all, we are aware of their detrimental effects on us. In certain reservoir areas infective agents, vectors and hosts form natural habitual associates in well-defined physical environments called niches or ecosystems. The dynamic factors in parasite interchanges in these environments are the subject of extensive ecologic studies. One can imagine that some infections carry on satisfactorily in these niches undisturbed, but such areas are being reduced by man's intrusion. Either man may intrude in his quest for his own requirements, or slowly the infection may extend its territory, perhaps in insects and often in rodents.

According to a recent compilation, man has acquired between 100 and 150 infections from animals of which 63 have been observed in the United States. In the United States there are 23 infections that man can contract from animals in the course of his occupation primarily. Of these 23, 12 are prevalent and well known: anthrax, brucellosis, contagious ecnthyma, ersepeloid, leptospirosis, Newcastle disease, psittacosis, Q fever, salmonellosis, taeniasis, trichinosis, tularemia; three serve as examples:

Anthrax is contracted by man mainly through contact with domestic animals and their fibers or skins. In the most heavily infected areas of the world, livestock is raised or tended in small herds by farmers or nomads where methods have remained unchanged for centuries. Animals sick of anthrax are left to die in the fields, and this perpetuates and spreads the infective agent to other animals and to man. Salvaging of the hides, hair and wool and even the meat is

Descriptors

occupational diseases
infectious diseases
animals
reservoir areas
agents
vectors
hosts
ecosystems
ecologic studies
insects
rodents
anthrax
contact
Leptospirosis
trench diggers
domestic animals
livestock
farmers
nomads
fatality
hides
hair
wool
meat
occupational infection
bone flour
bone, hoof, or meat meal
artificial feeds
dairy personnel
laboratory workers
aerosol
spores
lungs
Brucellosis
milk
cow
calf
abortion
veterinarian
fetus
membranes
vaccination
packing house employees
meat inspectors
fish cutters
cattle
pigs
horses
rodents
wild mammals
kidneys
urine
L. icterohaemorrhagiae
Weil's disease
dogs
Leptospira canicola
rats
sewer workers
abattoirs
farms

Abstract (continued)

likely to cause cutaneous and occasional internal human anthrax. Anthrax is an occupational infection of shepherds, herders, farmers, butchers, animal skinners, handlers of hides or fibers, veterinarians and pathologists. With the enforcement of good animal husbandry and the widespread use of vaccination after 1940, the rate has strikingly and steadily declined in the United States from 60 to 40 cases a year, with a low fatality rate.

Asia has been distributing contaminated animal by-products such as hair, wool, and skin, and this has reverberated in industrial plants and in agriculture elsewhere through use of unsterilized bone flour and bone, hoof or meat meal as artificial feeds on farms. The U. S. Department of Agriculture has established new requirements that have eliminated the risk from that source.

Aerosol sampling indicated that hair and wool workers may inhale hundreds of spores into their lungs (alveoli) each day without suffering clinical illness.

Brucellosis--Man acquires this infection in two ways: again, through drinking raw infected milk, which once affected the productivity of working people but was not occupationally acquired; or through contact with the cow and calf at the time of abortion. The herder, the veterinarian, and anyone else in the richly contaminated environment at a time when this infection afflicts herds inevitably acquire this long-lasting, demoralizing illness unless they are immune through previous infection, vaccination, or natural resistance. The particularly dangerous bovine is the heifer that has aborted. The fetus and the membranes should not be handled with uncovered hands.

Other surveys made in 1930 to 1932 using intradermal test on several thousand persons conclusively proved that packing house employees, meat inspectors, (52%), and veterinarians (60%), furnished higher reactor rates than dairy personnel (16%).

Leptospirosis--Leptospirosis is an infection of man and animals caused by many different types of similar organisms, the leptospires. The reported incidence in the United States--715 cases in the last 15 years, and only slightly over 1,000 in 58 years--is unbelievably low. The explanation may lie in diagnostic failure.

The underlying parasitism is relatively simple: leptospires are transmissible from animal to animal, and from animals to man. Infection in man is accidental, and with rare exceptions it represents a dead end in the chain of transmission--it is not continued from man to man nor from man to animals. Rodents and certain domestic animals are considered the primary animal carriers; some wild mammals have been added to the list

Of the ten leptospires so far isolated in the United States, L. icterohaemorrhagiae is the most dangerous, The key to the spread in human beings, cattle sheep, and goats, is the widespread excretion of leptospires in the urine of the carrier animals, rodents, pigs, dogs and others. After the parsite is excreted it may survive for up to three weeks in wet soil, stagnant water, or slow moving streams. Leptospiral disease of man is more definitely associated with certain occupations and pastimes than are most infective fevers. Except for canicola fever (transmitted in the urine of dogs), people rarely become infected at home, unless the premises are heavily infested with rodents.

Abstract (continued)

Dr. Joseph Molner traced a group of occupational infections to unsanitary poultry processing houses heavily infested by rats.

Review of the published reports on Weil's disease in the United States until 1950 gives the impression that sewer workers, fish cutters, and trench diggers are slightly more frequent victims of sporadic cases of this disease than are livestock or laboratory workers. With the rapid apparent increase of bovine and porcine leptospirosis, it may be anticipated that contact with domestic animals in abattoirs or on farms will increase.

Disease/Solid Waste
Abstracts

No. DSW- 582

Author

Dorald M. Allred

Title

Mites as Intermediate Hosts of Tapeworms

Reference

Utah Sc. Arts, and Letters, Proc.

Doc. No.	**Contract No.**	**Date issued**
V.31:44-51		1954

Abstract

The tapeworms are generally divided into two subclasses, the Cestodaria and Destoda. Th orders of the former group and several orders of the Cestoda are chiefly parasites of fishes.

In the Cestoda there are two orders which contain species parasitic in man and other terrestrial animals; these are the Pseudophyllidea and the Cyclophyllidea. The Pseudophyllidea contain species which are parasitic in fishes, reptiles, birds, and mammals. Although little is known of the life cycles of this group as a whole, relatively more is known concerning the life cycle of the fish tapeworm of man, Diphyllobothrium latum. If one uses this life cycle as a typical example for the group, he may assume that terrestrial mites play little or not part in the [illegible].

In the Cyclophyllidea it has been shown definitely that mites act as intermediate hosts for the larvae of some of the tapeworms of animals. The majority of the species of tapeworms known to have mites as their intermediate hosts occurs in two families, the Catenotaeniidae and the Anoplocephalidae. The Catenotaeniids parsitize rodents. The major species is Catenotaenia pusilla Goeze, 1782, which occurs in the house mouse, meadow mouse, black and Norwegian rats, laboratory mice, and other rodents. Its distribution is Europe, Japan, North America, and generally throughout the Northern Hemisphere. The onchosphere becomes a merocercoid larva in a mite, Glycyphagus domesticus. Fifteen days after ingestion of the onchosphere by the mite, the tapeworm larva is infective to rodents.

The Anoplocephalidae contains the majority of the species of tapeworms which parasitize mites as intermediate hosts. The adults of this family are parasitic in mammals, birds and reptiles.

According to Stunkard (1940), three species of Bertiella have been referred

Descriptors

subclasses
tapeworms
Cestodaria
Cestoda
parasites
fishes
orders
species
Pseudophyllidea
Cyclophyllidea
Diphyllobothrium latum
mites
intermediate hosts
larvae
animals

Catenotaeniidae
Anoplocephalidae
rodents
house mouse
Catenotaenia pusilla
meadow mouse
black and Norwegian rats
laboratory mice
mammals
birds
reptiles
Bertiella
human parasites
B. studeri

primates
Oribatei
oribatid group
aquatic mites
terrestrial mites

Abstract (continued)

to as human parasites. Although rarely occurring in man in modern times, B. studeri is the only original tapeworm acquired by man through evolution. The scarcity of this species today as a human parasite ... can be easily understood by the 'domestication' man has undergone...." Found primarily in primates, since 1913 this species has been found in humans eleven or twelve times.

With only one exception, all mites which have been shown to be intermediate hosts of tapeworms belong to the superfamily Oribatei. Stunkard observed that mite species which frequent fruit serve as natural intermediate hosts of B. studeri. Wardle and McLeon (1952) believe that free-living, soil-dwelling mites of a wide range act as intermediate hosts. This theory fits in well with the habits and life history of the oribatic group.

Summary: Aquatic mites may act as intermediate hosts for some species of tapeworms whose life cycles occur in an aquatic habitat. Terrestrial mites are known to act as intermediate hosts for species of two families of tapeworms, the Catenotaeniidae and the Anoplocephalidae. Forty species of mites of the superfamily Oribatei and 1 species of the superfamily Acaridiae have been involved as intermediate hosts for 13 species of Cyclophyllidean tapeworms. Because of their varied habits and habitats, other species of mites may be shown through further investigations to be intermediate hosts of tapeworms.

No. DSW-583

Author

B. E. March

Title

Fish as Food, V. II, Nutrition, Sanitation,
and Utilization
(Edited by Georg Borgstrom)

Reference

Academic Press, New York and London

Doc. No.	Contract No.	Date issued
664.9 B, pp. 378, 1962		

Abstract

In the first bulletin published by the United States Fish Commission in 1881, mention is made of fish as feed for cattle. In a letter Isaac Hinckley gives an account of the "fish-eating" cows of Provincetown, Massachusetts. When fishermen were cleaning their catch on the shore, the cows used to crowd about for an opportunity to eat the offal. It was said that cows newly brought to Provincetown would refuse fish and that they were accustomed to it by the addition of minced fish to their feed.

...It seems strange that when the fish reduction plants went into operation, the potentialities of fish meal as feed were largely disregarded. For many years, therefore, fish meal was used principally as a fertilizer and was usually referred to as fish guano. In 1884, Atwater reported the analysis of a sample of fish guano made from salmon offal....

Woodman (1937)...credits the Norwegian government with the first large-scale feeding trials carried out in 1892 to ascertain if fish meal was a suitable feed for farm animals. The success of the Norwegian and the German experiments resulted in the general use on the continent of fish meal as an animal feed. In the United Kingdom and the United States, in spite of these findings and the growing use in continental Europe of fish meal for animal feeding, such meal continued to be utilized as fertilizer for some years. It was, however, not until after World War I that its use in feeding became an accepted practice.

Early records of fish as feed for livestock dealt mainly with cattle, sheep, and pigs.... The greater part of fisheries products used in United States feeds today, however, goes into poultry rations, and most of the studies carried out in recent years on the nutritive properties of fish meals and other fisheries products have been in connection with poultry and, to some extent, hogs.

Descriptors

feed for cattle
fish guano
farm animals
livestock
poultry rations
infections
fresh fish
man
C. botulinum
Streptococcus faecalis
Shigella
bacillary dysentry
lakes
handling
fish consumption
cows
salmon offal
animal feeding
fish meal
hogs
disease
frozen fish products
food poisoning
Escherishia coli
C. welchii (*perfringens*)
crayfish
foci
reservoirs
processing
public health
fertilizer
feed
meal
fisheries products
ruminants
diarrheas
salmonellas
staphylococci
Proteus
Bacillus cereus
rivers
intermediate hosts
contamination
epidemics
bacterial poisonings

Continued on Page 9

Abstract (continued)

The possibility of fish productc conveying disease has been clearly recognized by fur breeders. Diarrheas and other symptoms have frequently been traced to fresh or frozen fish products.

In recent years, there are several reported cases from West Germany and Netherlands where salmonellas have been carried by fish meal to hogs and poultry and secondarily also to man (Mossel et al., 1958). According to Grimbergen (1959), Dutch fish meal was far more incriminated than any imported meal.

II. Bacterial Food Poisoning (J. M. Shewan-Author)

From the small amount of data available, it is clear that fish and fishery products can be the vehicle for all the more important types of bacterial food poisoning. These include not only salmonellas, staphylococci and C. butulinum, but also the so-called nonspecific group (*Escherichia coli*, *Proteus spp*., *Streptococcus faecalis*, *C. welchii* (*Perfringens*), *Bacillus cereus*, etc.). It will be noted, however, that the cause of the majority of poisonings in most countries has remained undetected. It should also be stressed that the incidence of food poisoning from fish, as indeed from all foodstuffs, is probably much greater than that indicated in official statistics. Compulsory notification of food poisoning is not in force in all countries and not even in all of the United States. Hence, many incidents go unrecorded.

All the available evidence shows, fish normally do not suffer from *Salmonella* or *Shigella* infections. As mentioned earlier, they may well carry these infections if caught in polluted waters (see Brunner, 1949; Reisler, 1952, p. 323, Moore, 1954, and Steiniger, 1951); but this risk is of much less importance in marine fish than in fresh-water species, where the dangers of pollution in rivers and lakes can be very real.

Thus, of the 97 fish, comprising 10 species, examined from the River Plate (Leiguarda et al., 1950), 19.6% carried *Salmonella* spp.; 11% of the fish, mainly from the River Nile, on the Cairo market harbored salmonellas and shigellas (Floyd and Jones, 1954); and 6% of the fresh-water crayfish from Polish rivers and lakes were infected with *S. typhimurium* (Gaugasz and Malwinska, 1957). Bacillary dysentery has also been endemic for a long time in the region of the Great Lakes in Central Africa and, despite energetic prophylactic measures, persistent foci have remained (Jadin et al., 1956, 1957). Although it is not suggested that the fish suffer from these infections, ehty do appear to act as intermediate hosts for man, with the lakes themselves acting as immense reservoirs of bacillary dysentery. This is in marked contrast to ...where intestinal pathogens have not been encountered.

As already stated,fish caught in the open sea are free from salmonellas and shigellas. It is to be expected, however, that, once the fish have been handled on ship and on shore, some contamination from human sources is likely to ensue. Fecal contamination, as evidenced by the presence of *E. coli* and fecal streptococci, increases during handling and processing.

In recent years, there has been an outburst of *Salmonella* epidemics, chiefly in West Germany, which could be traced to imported fish meal. These salmonellas spread to humans via livestock. Meal manufactured under primitavie conditions in such warmer areas of the world as, e.g., Angola, more frequently carried these pathogens....

Abstract (continued)

II. Fish-Borne Food Poisoning in Japan (Toshiharu Kawabata-Author)

From ancient times, fish and their products have been the most important animal protein source in the Japanese diet. The taboo on eating cattle, dating many hundreds of years back, seems to some extent to have affected animal habits, particularly in rural regions.

Fish consumption is, however, hampered by poisonings that constitute a hazard to public health. According to statistical data...more than 60% of all such outbreaks refer to fish or fish products.

...Many outbreaks remain undiagnosed. Clinical and epidemiological data, including the incubation period, symptoms, prevailing seasons, etc., clearly suggest that most of these cases are of a bacterial nature.

Bacterial Poisonings - Salmonellas and staphylococci are most common in this group. ...The number of outbreaks caused by the consumption of fish, shellfish, or other marine products accounts for more than 50 to 60% of the bacterial poisonings. This high frequency may be due to one or more of the following causes: (1) the preference for fish or shellfish in the raw stage. Numerous outbreaks are in fact attributed to raw fish. Some fish products, such as broiled, steamed, or fried fish paste products ("kamaboko," "hanpen," etc.) which are also consumed without further cooking are incriminated. (2) The low price of sea food as compared to other animal products. (3) The high degree of perishability combined with the time from capture to final consumption. Refrigerators are not very common, especially in rural districts. Furthermore, most people prefer fresh fish flesh to frozen. Most of the poisoning outbreaks have been due to improper handling or inefficient preservation.

Polluted Waters and the Contamination of Fish (A. Guelin-Author)

Enterobacteriaceae common to fish, or accidentally living in the digestive system for a prolonged period, may not furnish useful information regarding the actual sanitary state of the waters. The presence of these bacteria merely indicates that a contamination has taken place, but perhsps long ago, and has no relationship to conditions in the waters under study.

The publications from the last sixty years concerning the bacteriology of fish have either been inspired by sanitary precautions, by a desire to investigate the origin of bacterial contamination of commercial fishes of by the study of the problem of polluted waters.

An analysis of all these observations reveals contrdictory results in a few cases. Prior to 1926, particularly, authors frequently reported the isolation of enteric microorganisms. On the other hand, almost as many found none.

These contradictory results are explained by the absence of coordination in the study and by the development of our knowledge on Escherichia and Esch. like bacteria.

..As a whole the results show the accidental character of the presence of Enterobacteriaceae in fish.

The enteric bacteria do not seem to represent the normal flora of fhis.... The presence of enterobacteria in a fish may be explained by its being contaminated, and thus reflects a pollution of the waters which the fish has been frequenting.

Abstract (continued)

Studies were, therefore, started with an experimental contamination if fish viscera. In the course of these experiments, 61 samples of Ctenolabrus rupestris, of average size, were contaminated with either E. coli 16, or with coliphage 36. Previous examination of some specimens of Ctenolabrus rupestris, as well as of the waters used in these experiments, eliminated the possibility of the presence of E. coli and of coliphages other than the experimental contamination. The fish were then placed in clean water for observation.

According to the results, the contamination of fish by E. coli and by coliphages is not of long duration. On the seventh day, no fish contaminated E. coli any longer. The bacteriophages disappeared between the eighth and twelfth day....

It would be necessary to repeat these experiments with other species of fish and other enteric bacteria. The brief survival period of intestinal bacteria of man and warm-blooded animals in the fish digestive tract does, however, offer a basis for demonstrating the pollution in waters, where fish are caught.

Salmonella Problems in the Sea (R. Buttiaux-Author)

Recent publications all prove the negative results of studies undertaken to find salmonellae and other enterobacteria of fecal contamination in marine fish caught in the open sea. Certain observations indicate, however, their presence in fish when they are marketed fresh or dispatched from the filleting or icing establishments.

Marine fish, nevertheless, seem to be rare agents for transmission of enteric bacteria, at least in countries with good sanitation standards. Edible oysters, mussels, and other shellfish are, on the other hand, very often infected by salmonellae, because the indispensable sanitary precautions are neglected in the cultivation areas. They are still frequently the origin of large epidemics of typhoid fever in some regions of the world.

For marine fish as well as for mollusks, contamination by pathogenic enterobacteria may be caused by a number of factors, being subject to arguement still and in certain respects insufficiently studied. Nevertheless, they will be further analyzed below.

Self-cleansing of the Sea - The sea is the natural recipient of surface water from the land. Along the coasts, it also receives used water, sometimes without any previous cleansing treatment, either directly or via river mouths. Far away from shore, sea water may be polluted by fecal substances from birds or ships. Even though the former, for all practical purposes, constitute a negligible source of contamination, the latter may cause water surfaces to be temporarily highly contaminated. This has been observed when naval units pass an area. But aside from such exceptional circumstances, fecal pollution of the marine environment is almost exclusively a coastal phenomenon.

...Self-cleansing may be due to special conditions, some of which are still insufficently known.

...It is evident that an intimate mixing of sea water and polluted fresh water is difficult or takes place very slowly. Under these conditions, rather unfavorable for a cleansing action through dilution, the following factors are most essential in order to accomplish a reasonable purification of the water.

Abstract (continued)

Oxidation is facilitated by waves and stream movements.

Sedimentation and adsorption bymarine sediments exert an influence on the rate of cleansing. However, the decrease in the number of microorganisms found after active sedimentation is only apparent. The microorganisms fixed to deep sedimented layers stay there only temporarily. They are not destroyed, and go into suspension, sometimes, whtough waves, winds, and currents.

The destruction of bacteria by protozoans and microscopic animals normally living in the sea or in the polluted water reaching the sea is another essential force. Stryszak (1949) suggests that these protozoans are the major agents for the destruction of salmonellae in a marine environment. Waksman and Hotchkiss (1937) remark that the multiplication of the protozoans, copepodes, and other minor marine animals is proportinate to the degree of destruction of bacteria in the zones studied.

Bacteriophages probably contribute little or not at all, in this case, toward the destruction of pathogenic bacteria.

The salinity of the marine environment...has little effect on microbial life.

Finally, everyone who has taken an interest in marine biology admist that sea water has a bactericidal effect on enterobacteria. The nature of this bactericidal power is still being discussed, but everybody admits its thermosensitivity....

Survival of Salmonellae and Other Enterbacteria in Sea Water

...The data hitherto collected are still highly inadequate. It is indispensable to follow through with further investigations before giving any final opinion as to the risks of survival of these bacteria.

.. All...statements, both the older ones and those of more recent dates, were made without taking into consideration currents in the surface water.... They play a paramount role in the spreading of polluted waters across the surface of the sea. The results...studied, which took place during the warm months...show that complete purification is not achieved within a range of 400 meters in the North Sea, and in the mouth of the Rance it was furthermore influenced directly by the tide. In the latter case, it is necessary to go 1,000 meters from the outflow to find a complete disappearance of coliforms and of E. coli. Aglitskii and Khait (1952), ...sometimes observed contamination of sea water at a distance of 3,000 meters from the point of outflow of sewage.

It is generally considered that salmonellae are no longer found where E. coli and coliforms are controlled or have disappeared. This reasoning results from the neglect of two basic principles during experimental studies.

In experimental investigations on the inoculation of salmonella cultures into sea water in bottles, the duration of their survival is proportionate to the amount of inoculate.

It has been possible to investigate salmonellae in the sea. ...Calculations prove that these bacteria could multiply, availing themselves of abundant organic substances in the surrounding water.

Abstract (continued)

These publications show that it is not exceptional to find viable salmonellae in sea water contaminated by polluted water. At the present, however, it is impossible to maintain that these bacteria may be encountered all along the coastal area, even outside the polluted zones. These conclusions naturally are essential in explaining the origin of salmonellae occasionally found in edible fish or shellfish.

Bruns stated in 1909 that body organs and flesh of healthy fresh fish are sterile at the moment of their catch. Later, other authors have confirmed that fish never contain coliforms when caught in the open sea. Nor is there any evidence which allows the conclusion that pathogenic enterobacteria may be encountered there (Shewan and Liston, 1955). On eht other hand, everybody recognizes that fish may become infected through their intake of food when staying in sea water contaminated by sewage water or polluted rivers. This rule applies also to fresh-water fish.

But in all these cases of contamination when the fish is staying in an environment contaminated by enterobacteria, these bacteria are readily eliminated as soon as it is returned to noncontaminated water. Consequently it behaves like oysters, mussels, and other shellfish, whose self-cleansing is reliable and rapid when they are placed in clean water.

...Fish caught in distant waters, i.e., those dominating the fish trade, may be considered free from pathogenic anterobacteria. At the moment of their catch no microorganisms have been found which point to fecal contamination, such as E. coli or other coliforms, streptococci D, fecal bacteriophages, etc. The sanitarytary aspect is completely different when analyzed at the point of sale to the customer or on arrival at a processing plant. Spencer and Georgala (1958) isolated coliforms in 92%, 78%, and 68% respectively, of the cases during three series of examinations carried out in Scotland. They appeared during the handling or in the operation of transporting or processing. The detrimental effects of fecal contamination in the course of preparing frozen fish was pointed out by Larkin et al. (1956). The most frequent causes for these extramarine contaminations may be summarized in the following way:

1. One source may be the ice used in the holds of the ship or in boxes ashore, if it is manufactured from polluted water. Hompesh (1953) attributes an epidemic of typhoid fever in Dortmund to this factor.
2. Lack of cleanliness in the hold is another pathway for such contamination.
3. The boxes or baskets used for transportation of fish from the ship to the market are often charged with bacteria.
4. The manual worker as a carrier of microorganisms plays, as in other food industries, a major part in this contamination.
5. Poor sanitary conditions in and around the processing facilities may also take the blame. Badiali et al. (1957) isolated S. paratyphi B in tune; the place of unloading was infected by dogs, cats, and rats.

The presence of salmonellae as a result of such unsatisfactory conditions during handling, transport, and processing is particularly prevalent in fish meals used for animal feeding. Handloser (1956), during a large epidemic of human salmonellosis which raged in Brackwede (Germany) following consumption of pork sausage, was of the opinion that the meat utilized in their manufacture came from animals fed with contaminated fish meal.

Abstract (continued)

Salmonellae in Edible Shellfish

Salf-water fish that have been contaminated in coastal waters have great opportunities to eliminate the enterobacteria they have ingested during their stay in clean offshore waters. This problem is different for oysters and clams, which for their growth require a mixture of salt water and fresh water.... The mussel and oyster beds are invariably located along the coasts and especially in river mouths with tidal water movements. This provides the shellfish with a sufficient amount of fresh water but also increases the risks of dangerous contamination. In addition, mollusks of the group Lamellibranchia filter water, which they absorb, and retain a substantial part of the bacteria present in the water. Gevaudan and Gay (1958) found the following facts: in water containing 2,400/ml. *S. typhi*, only 120/ml. bacteria are found after 24 hr.; mussels immersed in this same water show, on the other hand, a count of 400 to 800/ml. after the same period. If a renewed contamination of the water is carried out with water containing a concentration of *S. typhi* of 3,200/ml., the mussels after 24 more hr. show counts of 800 to 1,600/ml. but the surrounding water only contains 170/ml. This concentrating action by the mollusks renders them hazardous to the consumer, if eaten raw and without previous purification. The contamination of sea water through fresh water or polluted water containing salmonellae should, therefore, be avoided at all costs in the zones employed for the cultivation of edible shellfish as well as in the natural locations for their development. Keeping in mind the studies discussed in Section III, B, it is obvious that salmonellae survive in marine environments during a sufficient length of time to be ingested in a fully vital stage by the mollusks. The latter, on the other hand, being completely immobile, cannot benefit from any self-cleansing water; the waters in which they live may, in fact, be repeatedly polluted. Finally, those enterobacteria that are absorbed may survive for a long time after the catch. Hunter and Harrison (1928), in surveying the literature, found that *S. typhi* remains alive during transportation to the consumer. Kelly and Arcisz (1954) studied experimentally the behavior of *S. paratyphi B* in the flesh of oysters and clams and arrived at the same conclusion.

These phenomena explain the frequency of salmonellosis provoked by oysters, mussels, and other shellfish. They have all been, and still frequently are, the cause of epidemics of typhoid fever, sometimes very serious ones. The list of observations in France of these incidents is too long to be presented here (Brisou, 1955). It may suffice to recall the United States epidemics in Chicago, New York, and Washington in 1924-1925. They were studied by Lumsden et al. (1925); 1,500 cases were reported, with 150 deaths.

It is difficult in practice, despite several controls, to avoid entirely the pollution of waters surrounding oyster and clam beds. ...As was rightly pointed out by Arcisz and Kelly (1955), the growing beds for many clams remain rare in zones of clean water due to the fact that greater yields are obtained in polluted areas. . .Mollusks contaminated with enterobacteria free themselves from these within 24 to 48 hr. when they are placed in water of sufficient salinity and devoid of bacteria. It should be kept in mind, however, that a self-cleansing of mollusks achieved under these conditions is never complete; some *E. coli* and salmonellae always subsist at the end of 48 hr. of treatment. Their final number depends upon the degree of initial

Abstract (continued)

contamination. So it is indispensable to avoid fecal contamination in the grounds of cultivation, if safe mollusks are to be obtained. All sanitarians agree on this point....

Fish

It appears important to direct research not only toward identifying the presence of salmonellae but also toward tracing their origin. These bacteria may derive from polluted waters where the fish have stayed. They are then present in their intestines. They may reach the fish by contamination in handling them subsequent to death. In this case the salmonellae cover the external surfaces of the fish body.

Salmonellae carried into the sea by an outflow of untreated sewage effluents may easily contaminate mollusks and fish in adjacent waters.

No observations of lesions or disease in fish caused by salmonellae have been published up to the present time. For all practical purposes, fish caught off the coast may be considered free from pathogenic enterobacteria. On the contrary, those caught in polluted littoral zones may be contaminated bu such bacteria. Most salmonellae on fish are procured in the handling, transporting, or processing operations when these are carried out under inadequate sanitary conditions.

Edible mollusks concentrate salmonellae in their bodies. Requiring for their subsistence a mixture of sea water and fresh water, such mollusks are readily infected when sewage effluents are not strictly controlled in coastal areas where they grew. Shellfish have in the past caused and still give rise in some countries to epidemics of typhoid fever.

Descriptors (continued)

shellfish
perishability
polluted waters
enteric microorganisms
bacteriophages
marine fish
mollusks
ships
sedimentation
waves
microscopic animals
salinity
survival of salmonellae
sanitary aspect
ice
baskets
cats
salt-water fish
raw fish
refrigerators
enterobacteriaceae
Ctenolabrus rupestris
enteric bacteria
oysters
fecal substances
self-cleansing
absorption
winds
protozoans
solar irraditation
outflow of sewage
fecal contamination
boxes
market
rats
S. typhi
sea foods
sanitary conditions
bacteriology of fish
coliphages
intestinal bacteria
mussels
birds
oxidation
marine sediments
currents
copepodes
bactericidal effect
fresh water fish
extra-marine contaminations
typhoid fever
dogs
meat
sewage effluents

Disease/Solid Waste Abstracts

No. DSW- 584

Author

B. Moore

Title

The Risk of Infection Through Bathing in Sewage-Polluted Water

Reference Proc. First Int. Conf. on Waste Disp. in the Marine Environ. U.C.Berkeley Ed, E.A. Pearson

Doc. No.	**Contract No.**	**Date issued**
		Jul.1959

Abstract

I should like to describe first two outbreaks that occurred in seaside towns during the bathing season, both attributed by local public opinion to infection during bathing, but in fact not due to bathing. This apparently negative approach will serve to provide a context for the discussion of various specific infections and of some of the technical problems that arise.

A Paratyphoid Outbreak;; In 1946, an outbreak of paratyphoid fever involving 21 notified cases occurred at a seaside resort in the south-west of England. Only 9 had in fact bathed or paddled during the relevant time, and in spite of local opinion a food-borne aetiology seemed far more probable. Twenty of the 21 patients had eaten ice cream; apparently only the product made by one local firm was involved.

The source of the infection was not discovered until 18 months later. The carrier proved to be the wife of the attendant who had actually sold the suspected ice cream during the summer of 1946, and a retrospective scrutiny of all the epidemiological data showed that she had had opportunities of contaminating the ice cream.

The story of this outbreak underlines two points in particular, firstly that the isolation of paratyphoid bacilli or of any other pathogen from seawater should not lead to the immediate assumption that sea bathing causes the corresponding disease; and, secondly, that the epidemiology of any infectious disease should always be considered as a whole.

Acute Non-Bacterial Gastro-Enteritis--A second example of a disease popularly, but, I think, wrongly ascribed to sea bathing is the clinically mild but tiresome epidemic vomiting, with or without diarrhoea, that plagues a number of our seaside towns during the summer months.

At one resort this illness is endemic and sometimes epidemic in the summer

Descriptors

beaches
sewage discharge
sewage
sewer outfalls
paratyphoid fever
sea-bathing
bathing
food-borne aetiology
ice cream
excreter
carrier
epidemiology
gastro-enteritis
disease
diarrhoea
enteric fever
poliomyelitis
sewage-polluted sea-water
typhoid fever
epidemiological evidence
Salmonella typhi
typhoid bacilli
bacteriological studies
polluted sea-water
Shigella sonnei
dysentery
Staphylococcus pyogenes
morbidity
coliform counts
risk

Abstract (continued)

months and is said to arrive with the visitors. Investigation pointed to an infectious condition that falls into the rather nebulous group of diseases which have been lumped under the name acute non-bacterial gastro-enteritis. It affects non-bathers as well as bathers.

Some recent investigations--The meager evidence available suggests that bathing is an unnatural activity in man, and that divin in particular may force nasopharyngeal bacteria into the middle ear, for example, and thus give rise to disease. Our working party has so far not concerned itself with upper respiratory infections, but with diseases the causal agents of which are known to be present in sewage, particularly enteric fever and poliomyelitis.

As regard enteric fever, bathing in sewage-polluted sea-water, especially in large harbors into which untreated sewage was being discharged, and where adequate dilution could not readily take place, has on occasion been claimed to have caused typhoid fever, e.g. in New York in the early thirties. But no detailed epidemiological evidence has ever to my knowledge been published on these cases, and critical assessment would in any event be far from easy, as they were reported at a time when our present-day techniques of Vi-phage typing of Salmonella typhi had not yet been worked out.

Bacteriological studies--Of 859 samples of sea-water two hundred and sixty-three yielded a salmonella. The numerical preponderance of paratyphoid strains greatly exaggerates their importance. Nevertheless, it would appear that paratyphoid bacilli multiplied more readily in the enrichment medium used than did other salmonellae, or that they survived longer in sea-water, or perhaps most probably that more paratyphoid bacilli were present in the samples collected for examination. The few isolations of typhoid bacilli may on the other hand underestimate the numbers really present, because of the greater technical difficulty of culturing this organism.

We have had very little success in isolating other pathogens from sewage-polluted sea-water, partly no doubt because of lack of suitable enrichment procedures. Attempts to isolate poliovirus failed. A colleague isolated Shigella sonnei once from direct plates of sea-water at a time when an extensive outbreak of dysentery was occurring in the community from which the sewage contaminating the sea-water was derived.

Epidemiological studies on enteric fever and bathing--The criteria used by the working party in assessing whether or not a case of paratyphoid or typhoid fever was probably due to bathing in sewage-polluted sea-water are given. An intensive effort has been made during the past four years to keep track of enteric fever patients giving a history that pointed to an association with sea bathing.

The medical officers of health of about 80 coastal administrative districts kindly looked through their records of sporadic enteric fever notified in the previous five years, to see if the paratyphoid morbidity in coastal areas differed significantly from the national figures. No evidence of an increased paratyphoid incidence in seaside residents emerged from a scrutiny of these figures, and surprisingly few of the cases recorded had been in the age group associated with sea-bathing.

As a result of these inquiries, only four cases of paratyphoid fever giving histories that pointed to a sea bathing infection have been detected in England

Abstract (continued)

and Wales during the past three years. It so happened that all four were associated with one or other of two beaches that had been intensively studied by members of the committee, and from which paratyphoid bacilli of the revelant phage types had been isolated beforehand. Both were grossly unsatisfactory even on aesthetic grounds, were contaminated with crude sewage and showed median presumptive coliform counts over long series of samples of 10,000 to 20,000 per 100 ml.

One may then sum up the evidence on the risk of contracting enteric fever from sea bathing by saying that less than one case a year of those that have come to our notice have given a history that suggested a sea bathing infection.

Study of bathing histories of poliomyelitis patients--Findings strongly suggest that in poliomyelitis patients who have bathed in the weeks preceding the onset of illness, the history of batning is probably irrelevant.

Disease/Solid Waste
Abstracts

No. DSW- 585

Author

V. V. Slesarenko, K.A. Dunaevsky

Title

Transovarial Transmission of Tick
Relapsing Fever Spirochaetae in Ticks
Alectorobius Asperus

Reference Meditsinskaia Parazitologiiai
Parazitarny E Bolezni (Moscow)

Doc. No.	Contract No.	Date issued
V.33;No.6;744-45		1964

Abstract

Transovarial transmission of tick relapsing fever spirochaetate in Alektrobius asperus was observed in the laboratory 1954 to 1963 throughout three descending generations. Ticks of the third generation at all stages and phases of their development infected guinea-pigs with spirochetosis. It is suggested that in the Ukraine the phenomenon of transovarial transmission of spirochaetate in vector-ticks appears to be the main factor conductive to prolonged and permanent existence of natural foci of tick relapsing fever in the Republic.

Descriptors

Disease/Solid Waste
Abstracts

No. DSW- 586

Author

Title

Water Pollution--Great Lakes (Part I--
Lake Ontario and Lake Erie)

Reference U.S. **Congress, 89th, 2nd Session**
Hearing before a Subcommittee on the Committee
on Government Operations, 22 July 1966.

Doc. No.	**Contract No.**	**Date issued**
GPO 67-442		7-22- 66

Abstract

Appendix 1--Statements of the Federal Water Pollution Control Administration. Statement on Water Pollution in the Lake Ontario Basin--Problems related to water pollution have been identified in Lake Ontario and most of its tributary streams. Some of these waters, particularly Lake Ontario, are experiencing the effects of overfertilization which promotes massive growths of algae. These growths, sometimes called blooms, seriously impair many important water uses and cause objectionable nuisance conditions that often exceed the tolerance levels of even the most insensitive persons.

Municipal waste treatment plants in the program area serve an estimated present population of 1,544,000. These plants receive additional waste loads from industries, a total population equivalent (PE) of about 2,350,000 (in terms of oxygen consuming capacity). Of the combined untreated waste PE of 3,894,000 received by the plants, an estimated PE of 2,299,000 is discharged to the receiving waters. This represents an overall average removal efficiency of about 41 percent, which is considerably less than removals of 90 percent or more attainable with secondary plants.

Approximately 300 industries discharge varying amounts of oxygen demanding wastes directly to receiving waters. In most cases little or no treatment is provided. The biochemical oxygen demand (BOD) of the wastes discharged by 52 of these industries is estimated to be 423,000 pounds per day, which is about 96 percent of the BOD from the 300 industries.

Other significant waste sources are overflows from combined sewer systems, runoff from urban and rural areas, and wastes from commercial and private vessels.

In addition to the organic oxygen demanding wastes other problem contaminants discharged to the environment include the algae nutrients, phosphorus and nitrogen

Descriptors

population equivalent
surface waters
solids
toxic metals
BOD
suspended solids
solids
synthetic dyes
oil
phenolics
cyanides
ammonium
inorganic
Lake Erie
tributaries
wastes
pollutants
sewage
industrial wastes
oils
silts
sediment
floating solids
nutrients
phosphates
nitrates
recreation
commercial fishing
sport fishing
navigation
water supply
garbage
esthetic values
eutrophication
overfertilization
trash
waste treatment facilities
deleterious
dumps
industrial plants
acids
alkalies
oil and tarry substances
phenolic compounds
organic chemicals
taste and odor problems
ammonia
nitrogenous compounds
phosphorous compounds
suspended material
toxic wastes

See page 4

Abstract (continued)

compounds, phenols, toxic materials, oil and grease, acids, alkalies, and bacteria.

Industrial Waste--There are approximately 300 industries in the Lake Ontario and St. Lawrence basins that discharge their wastes directly to surface waters. While the organic waste loading in terms of BOD represents the major pollution effect on the streams, there are also discharges of suspended solids, chlorides, toxic metals, phenols, dyes, and many other pollutants that are causing gross degradation. While the organic waste loading in termsof BOD represents the major pollution effect on the streams, there are also discharges of suspended solids, chlorides, toxic metals, phenols, dyes, and many other pollutants that are causing gross degradation. 52 major industrial polluters have either an effluent of 1,000 pounds per day of 5-day BOD (the equivalent of a population of 5,000-6,000) or a waste high in phenols, suspended solids, etc. Papermills and paper products plants, canneries, dairies, and other food processing plants, and chemicals and allied products plants are the worst offenders in the basin.

Supplemental Statement on Water Pollution Conditions, Eastern Lake Erie Vicinity--By H. W. Poston, regional director, Great Lakes region, Federal Water Pollution Control Administration, U. S. Department of the Interior) Excerpt from: Report on Pollution of Lake Erie and Its Tributaries, Part 3, New York and Pennsylvania Sources; U.S. Department of Health, Education, and Welfare, Public Health Service, Division of Water Supply and Pollution Control; July 1965. IV. Erie-Niagara. Principal Sources of wastes. Industrial wastes. Peter Cooper Corp. Moench Tanning Co. Each discharges wastes having considerable quantities of suspended solids. Industrial waste data: suspended solids (pounds per day) 9,580 + 7,600 = 17,180. Smokes Creek flows through the city of Lackawanna and the Bethlehem Steel Co. property before it empties into the lake. An indeterminate but large amount of industrial waste is discharged to the creek by Bethlehem before it enters the lake. Bethlehem Steel Co. also discharges wastes to the lakeshore and the harbor areas. Bethlehem Steel is one of the major sources of pollution in the Smokes Creek area, but detailed data concerning its discharges have not been made available by the State. There are five major industries on the Buffalo River. They use the Buffalo River as a source of water supply and also for waste transport.

Buffalo River--Industrial waste discharges: synthetic dyes; oil, phenolics, cyanides; phenolics, cyanide, ammonium, oil, solids and BOD; phenolics, cyanide, oil, and solids; inorganic.

Secretary's Summary of Conference--Summary of Conference, Second Session, Pollution of Lake Erie and its Tributaries (Michigan-Indiana-Ohio-Pennsylvania-New York), August 10-12, 1965--The chairman of the conference pointed out that: Lake Erie and many of its tributaries are polluted. The main body of the lake has deteriorated in quality at a rate many times greater than its normal aging processes, due to the imputs of wastes resulting from the activities of man. Identified pollutants contributing to damages to water uses in Lake Erie are sewage and industrial wastes, oils, silts, sediment, floating solids, and nutrients (phosphates and nitrates). Enrichment of Lake Erie, caused by manmade contributions of nutrient materials, is proceeding at an alarming rate. Pollution in Lake Erie and many of its tributaries causes significant damage to recreation, commercial fishing, sport fishing, navigation, water supply, and esthetic values. Eutrophication or overfertilization is of major concern. Algal growths are stimulated by nutrients. Many sources of waste discharge reaching Lake Erie have inadequate waste treatment facitlies.

Abstract (continued)

Disposal of garbage, trash, and other deleterious refuse in Lake Eries or its tributaries is to be prohibited and existing dumps along riverbanks and shores of the lake are to be removed. Industrial plants are to improve practices for the segregation and treatment of waste to effect the maximum reductions of the following:

(a) Acids and alkalies.
(b) Oil and tarry substances.
(c) Phenolic compounds and organic chemicals that contribute to taste and odor problems.
(d) Ammonia and other nitrogenous compounds
(e) Phosphorous compounds.
(f) Suspended material.
(g) Toxic and highly colored wastes.
(h) Oxygen-demanding substances.
(i) Excessive heat.
(j) Foam-producing discharges
(k) Other wastes which detract from recreational uses, esthetic enjoyment, or other beneficial uses of the waters.

Sewage Pollution of the Beaches of Lake Ontario: Past reports issued by the committee have established the following facts: (1) The discharge of raw sewage containing solids by Rochester's Durand-Eastman plant and Irondequoit's Pattonwood and Summerville plants. (2) The sporadic occurrence of extremely high coliform counts on the public beaches on Lake Ontario. (3) The existence of wind and current patterns which carry floats from the vicinities of these outfalls onto the beaches. (4) The frequent appearance on the beaches of grease balls identical in appearance to those discharged in the effluents of the sewage treatment plants.

The Summerville and Pattonwood sewage treatmentplants have continued to discharge effluents which generally contain sewage solids and which generally contain no residual free chlorine. (Our previous reports have demonstrated that such sewage from these plants was not properly disinfected and contained living bacteria.

Sewage grease balls in small amounts are found routinely on all of the beaches from Charlotte east beyond Webster. When the wind is onshore (northwest to east), massive deposits of grease balls can be found. Discharge of grease balls in large numbers from the Durand-Eastman plant continues. Chlorination of sewage containing solids does not result in reliable disinfection.

RCSI reports previously issued have established .... the discharge of sewage solids (paper, fecal matter, grease balls, etc.) at the outfalls of Rochester's Durand-Eastman plant and of Irondequoit's Pattonwood and Summerville plants.

Chlorine tests run at the Pattonwood plant outfall on May 13, 15 and 17 (since our last report was issued) were negative without exception; if this plant is chlorinating, the chlorine is gone by the time the sewage enters the river with its load of solids. (We have previously shown such sewage to be extremely septic). This plant discharged large amounts of black sludge on May 11 and 14; the Summerville plant discharged black sludge into the river on May 17, but has been chlorinating.

Abstract (continued)

The results we have obtained indicate that sewage solids and septic sewage continue to be discharged into the river and the lake, and that the flow patterns produced by wind and water currents are such as to frequently bring floating sewage back onto essentially all of the beach north and northeast of the city.

Sewage Pollution of the Lower Genesee River and Lake Ontario: Data published in previous reports issued by the Rochester Committee for Scientific Information established that the lower reaches of the Genesee River were heavily loaded with sewage, that this seage generally contained solids, that it was chlorinated only sporadically, and that coliform counts in this water were extremely high.

Sewage Treatment in Monroe County: Industrial wastes--The Rochester sewage treatment plant received industrial wastes from all Rochester manufacturing industries except Eastman Kodak Co. which has a primary waste treatment plant for its chemical wastes which discharge into the Genesee River.

The average organic load into the Rochester sewage plant from all sources is equivalent to the raw sewage from 1 million people. Since the population of Rochester is about one-third million, two-thirds of the seage load is caused by industrial wastes. The most difficult organic wastes to treat are those of high biochemical oxygen demand (b.o.d.) from breweries and canning companies. The city sewage plant must also contend with picling wastes from metal processing industries, and exotic chemicals which do not break down with present methods of municipal sewage treatment.

Rochester's sewer ordinance dates back to 1912. It places no effective restriction on the disposal of industrial wastes through the sewerage system, nor is this controlled by State health law. City officials are reluctant to force industries to clean up their wastes for fear such action may cause taxpaying industries to move to areas with less stringent regulations. City officials would like to see statewide regulation of industrial waste disposal.

I propose that instead of only spending increasing great sums for more sewer systems and more sewer plants, the Legislature and Congress direct that 10 to 20 percent of the funds appropriated for pollution control be used for research by competent companies to develop totally new and different methods of handling human and industrial wastes, which do not use water as a conveyor. Our water shortages throughout the world today are caused solely because we use water as a conveyor and dumping ground for sewage. F. W. Moffett, Jr.

Descriptors - Continued from page one

highly-colored wastes
oxygen-demanding substances
excessive heat
foam-producing discharges
recreational uses
esthetic enjoyment
raw sewage
solids
high coliform counts
public beaches
Lake Ontario
effluents
sewage solids
chlorine
bacteria
grease balls
coliform bacteria
paper
fecal matter
unchlorinated sewage

Disease/Solid Waste
Abstracts

No. DSW-587

Author

Raphael J. Salmon

Title Final Report R-OU-197
Environmental Health Planning for Postattack
Conditions: Some Problems, Programs, and
Priorities

Reference Research Triangle Institute
Durham, North Caroline, Office of Civil

Doc. No. Contract No. Date issued
Defense, United States Army, U. S. Public
Health Service - 1966

Abstract

Increased Significance of Preattack Health Hazards

Accelerated deterioration of environmental health conditions may originate from, and be stimulated by, conditions which already exist in the preattack period. Thus, if a community is infested by rats, flies, or other vectors, it is safe to assume that the potentiality of an acute vector problem would be greater in that community under the deteriorating conditions expected in a postattack period than in another community which has eliminated many existing vectors and their feeding and breeding places.

Changes in Nature and Incidence of Health Hazards

The general deterioration of the health environment, together with the cumulative effects of stress and changed conditions, and possible lower resistance of the population to disease, may lead to increased incidence of infections seldom or never experienced in certain communities, regions, and the country as a whole under normal conditions. In the absence of controls, epidemics of some diseases could occur. Specific definitive projections are difficult to make. There is relatively limited knowledge of the cause and effect relationships between possible attack conditions, disease incidence, and the general postattack recovery environment.

Subject to qualifications, priorities are assigned to the eight specific areas covered in this report as indicated below.

Priority I -- Local health department planning, provision for improved postattack communications between public health personnel and with the public, together with general public education and training, would all be expected to play major roles in survival, recovery, and the level of performance of the postattack population. Preparedness of public health personnel and facilities and their flexibility in responding to postattack needs also would be important in this regard. Organizational

Descriptors

sewerage
fecal matter
sewage collection
fuel
insect populations
vectorborne disease
rodent poisoning
vector extermination
hygiene
salmonellosis
murine typhus
ratbite fever
encephalitis
malaria
falciparum malaria
Rocky Mountain Spotted Fever

enteric diseases
radiation sickness
garbage generated
cremation
birds
spraying operations
human wastes
Thermonuclear war
zoonoses
domestic rats
plague
leptospirosis
typhus
yellow fever
mosquito control
Bacteria

transmission
treatment
survirors
radiation sensitivity
ecological factors
delousing
animal wastes
refrigeration
brucellosis
fleas
lymphocytic choriomeningitis
mosquito
pediculosis
denge
tickborne hazards
viruses

(Continued on Page 6)

Abstract (continued)

preparedness in this field in complex, but its comparatively low cost and high potential warrant its high priority rating.

Water supply preparedness is of equally high priority. Safe water supplies must be assured not only for stark survival, but also because water plays a key role in utilization of other essential resources and services.

Vector populations and disease distribution have significant effects on the health of thermonuclear attack survivors. This area is also assigned the highest priority.

Priority II - Sewage treatment and disposal are projected as somewhat lower priority problems since with careful planning and relatively simple treatment methods, it is believed feasible to collect and disinfect domestic wastes adequately under postattack conditions. The probable low level or preparedness of the urban population for improvisation still would demand close attention from local health department personnel, however, to assure safe sewage disposal under expected emergency conditions.

Although certain difficulty is expected in providing necessary services and proper sanitation, it is estimated that the quantity of housing remaining after attack would be sufficient for the surviving population. Housing is therefore accorded a second priority rating as a problem area.

Priority III - Contaminated food supplies under the conditions studied, refuse disposal, and disposition of the dead are expected to pose relatively insignificant hazards in a postattack environment. They require comparatively simple operations and are considered third priority problems.

In the area of administration and emergency planning for environmental health services, for example, emphasis is primarily on action programs aimed at increasing postattack preparedness and on short-term research aimed at implementing planning and action programs to cope with postattack conditions. Vector control and distribution of disease, on the other hand, represent areas in which preparedness could benefit greatly from medium and long-range research activities aimed at developing knowledge relative to postattack planning. This situation exists also in the areas of water supply and pollution control, and, to a lesser degree, relative to food and other anticipated deficiencies covered in this study.

...Comprehensive and systematic planning is greatly needed.

Research Priorities

a. Evaluation and development of improved means of training public health personnel (including auxiliary personnel) to understand, and function effectively under, expected postattack conditions. It should be geared to projected manpower requirements, availability of equipment and data, improvisation of operations, and the knowledge level of supporting agencies and the public.

b. Study of the feasibility of developing area-wide plans for environmental health operations and development of one or more prototype plans in specific areas for demonstration purposes. Lines of authority and cooperation between agencies concerned with environmental health should be clarified. Techniques to be utilized by communities to survey available and projected resources, supplies, and needs, especially in the areas of water supply, medical supplies, emergency equipment, and food should be developed and improved.

Abstract (continued)

c. Exploration if disease distribution patterns and health status in selected communities as a basis for further research on specific postattack health hazards.

d. Assessment of means of increasing water supplies, utilizing techniques expected to remain functional under postattack conditions. Simultaneous evaluation should be undertaken of alternative water uses and procedures for development and management of water resources of a specific area.

e. Evaluation of means of controlling large numbers of insects and rodents on an area-wide scale, utilizing equipment and materials expected to be available in a postattack period. Such evaluation should consider the spectrum of vector problems as related to the expected postattack environment.

The postattack conditions considered for purposes of this study do not include attacks involving the use of chemical or biological warfare agents.

The significance of psychological reactions and their relationship to health, recovery, and general functioning in a postattack period is recognized, but analysis has excluded these considerations. Economic feasibility of the recommended programs has not been specifically studied.

...Certain environmental health factors have been isolated for study.

Chapter IV - Effects of Disposal Problems on Health

Sewage Treatment and Disposal

Analysis of the vulnerability of sewage systems to attack damage must be made in terms of specific systems, plants, and processes.

If fallout necessitates shelter confinement, and chemical toilets are not available, the problem of waste disposal may well be intensified. Human wastes disposed outside shelters would attract flies and support their reproduction. Transmission of enteric diseases through transmission of fecal matter by flies could be a significant factor in the presence of large numbers of persons already ill and weakened by radiation sickness.

Recommendations

1. Community action programs should include development of plans for effective, expedient sewage collection and disposal under emergency conditions.
2. Research programs should include:
    a. Exploration of alternative sewage disposal methods relative to the characteristics of the waste, the community, and expected postattack conditions; and
    b. Investigation of means of improving forecasting of the effects of untreated wastes on receiving waters and of quantifying expected pollution hazards.

Refuse Disposal

Loss of equipment, fuel, and trained personnel may be expected to disrupt organized disposal services. Large quantities of debris would result from nuclear attack. Garbage would be generated at a level commensurate with the decreased level of food availability, and the number of survivors. Refuse laden areas could

Abstract (continued)

serve as breeding locations for filth flies and as feeding areas for other surviving vectors and would contribute to the generally insanitary conditions expected.

Recommendations

1. Community action programs to increase postattack preparedness should include formulation of specific plans for refuse disposal under given emergency conditions.

2. Research activities should include:

   a. Evaluation of the effects of refuse on deterioration of environmental health conditions in a postattack period; and

   b. Medium and long-range investigations of effects of refuse on vector and disease spread under postattack conditions.

Disposition of the Dead

Heavy reliance would have to be placed on persons not trained in this function.

Local public health personnel would be expected to assist in developing plans for, and in supervising, mass collection and disposal procedures in a postattack situation. The ready availability of fuel and the fact that relatively little movement of bodies would be required make cremation an obvious means of disposal.

Chapter V - Vector Control, Geographic and Time Distribution of Disease

Assessment of vector control and of geographic and time distribution of disease cannot be undertaken effectively without more knowledge of the responses of organisms as a whole, including man, to given environmental changes. Unfortunately, the trend today is rather to focus attention on subjects which are regarded as more fundamental -- namely, on detailed analysis of structures and reactions in isolation from the living organism.

Vector Control

Effects which thermonuclear disaster may have on vector populations are not well understood.

The possibility of increases in insect and rodent populations due to ecological factors, differential radiation sensitivity, and destruction of natural predators pose real problems in forecasting vector distribution in a postattack environment. Uncontrolled, the effects of vectorborne diseases on community survival and recovery efforts could be significant.

The potential role of local health personnel in curbing vector populations would be twofold: (1) development of plans for, and supervision of, vector control measures such as spraying operations, delousing, and rodent poisoning activities, and (2) development and supervision of expedient programs for collection and disposal of refuse and waste (limited to situations in which these pose direct threats to human health).

Growth and spread of vector populations do pose potential environmental health threats under postattack conditions.

Abstract (continued)

Recommendations

1. Community action programs should include:

a. Development of priorities and procedures for vector extermination, ... Study of successful techniques for mass control of insects and rodents.... Alternative emergency equipment and supplies needed for vector control operations should be identified in terms of both effectiveness and accessibility.

b. Development of expedient programs for collection and disposal of refuse and waste which provide vector breeding grounds....

c. Training programs for in-service and auxiliary personnel....

2. Research efforts should focus upon:

a. Critical analysis of the relationship of projected postattack conditions to development of vectors and of the relationship of the anticipated spectrum of vector problems under stipulated postattack conditions to planning which may limit disease spread among a population group,

b. Further study and development of effective techniques for mass control of insects and rodents on an area-wide scale, using equipment and materials expected to be available during a postattack period; and

c. Evaluation of effects of radiation exposure at moderate to severe levels, and under different conditions, on plant life, and on pathogenic, and/or nonpathogenic organisms (including known and potential disease vectors). Without such ecological analysis, projections of pastattack environmental health problems are severely limited.

Geographic and Time Distribution of Disease

Some mechanisms of linkage with respect to disease hazards constantly faced in the present environment are still poorly understood. Thermonuclear war would bring about radical and abrupt changes in man's environment and require from him more rapid adjustments than were ever necessary before. Such conditions undoubtedly would result in significant biological physiological, and psychological reactions, the causes and results of which are yet unclear.

Limitations on services, such as refrigeration, and deterioration of personal and general hygiene could be expected to lead to increases in zoonoses such as brucellosis and salmonellosis. Flies...could cause rapid disease spread. Domestic rats and infected fleas...may lead to...increases in murine typhus. Minor incidence of plague, ratvite fever, lymphocytic choriomeningitis and leptospirosis also could be expected. Human enciphalitis could occur in both rural and urban areas. ...Endemic typhus could be expected to increase as a result of pediculosis. Although the possibility of increases in malaria, yellow fever, and dengue fever exists, in the past decade, and despite periodic importation, neither malaria nor dengue fever have become reestablished endemically or epidemically by this route. Recently, however, cases of quinine resistent falciparum malaria have been discovered among troops returning from Indochina. ...There is at present no therapeutic agent available for this disease, and its occurrence in the civilian population of the United States is a possibility. It is doubtful that environmental changes in urban areas would cause significant increases in human tickborne hazards, although Rocky Mountain Spotted Fever is widespread in the western part of the country.

Abstract (continued)

Shigellosis is one of the most likely infections in the early postattack phases; incidence in individual cities might reach as high as 90 percent depending upon conditions. In crowded conditions, typhoid could be a serious threat since most of the United States population has little immunity to this disease.

Although focal points of infection for many serious diseases obviously exist at the present time in the United States, they are quire rare. Postattack conditions may increase the opportunity for spread of disease from its endemic foci. Large dislocations with mass movements of population, may be conducive to spread of disease to a large number of susceptibles.

Hospitals...may serve as endemic sources of infection, especially when overcrowded.

Recommendations

1. Action programs should include community assessment of health and disease distribution patterns.
2. Medium and long-range research efforts should consider:
    a. Factors affecting disease incidence and spread under anticipated post-attack conditions.
    b. Investigation of the limits of man's natural elasticity in ability to adjust and adapt to his environment....
    c. Further study of the effects of irradiation....

Descriptors (continued)

preattack
flies
breeding places
incidence
endemics
planning
training
vector populations
domestic wastes
food supplies
health preparedness
administration
action programs
systematic planning
manpower requirements
agencies
food
chemical or biological warfare agents
waste disposal
Shigellosis
immunity
food handling
pneumococcus
shelter living

(Continued on Page 7)

health hazards
vectors
resistance
infections
priorities
communications
preparedness
sewage treatment
sanitation
refuse disposal
research
emergency
vector control
stockpiling
equipment
techniques
insects
psychological reactions
economic feasibility
sewage systems
crowded conditions
staphylococcal infection
food poisoning
diptheria
tuberculosis

rats
postattack period
disease
controls
health department
education
water supply
disposal
housing
dead
recommended action
planning
pollution control
resources
operations
medical supplies
rodents
recovery
environmental health factors
chlorine
typhoid
streptococcal infections
clostridiums
meningococcus
Coxsackie

Descriptors (continued)

infectious hepatitis
impetigo
spread of disease
hospitals
ECHO
nutrition
endemic foci
disease incidence
scabies
fatigue
dislocations of population

Disease/Solid Waste
Abstracts

No. DSW-588

Author

O. Havlik & V. Chladek

Title

Protection of Health in Biological Warfare

Reference

Army Foreign Science & Tech, Center.

Doc. No.	Contract No.	Date issued
FSTC-381-T64-53, AD 475-912	G7-1050,	Jan. 1965;

Abstract (Translated from: DER GESUNDHEITSSCHUTZ IM BIOLOGISCHEN KRIEG, pp. 1-164, 1962,, Atch 1, IR-2214012264)

An unusually complicated and difficult task consists in the safeguarding of sufficient supplies and the organization of production of decontamination, disinfection, insect extermination and deratization means. Sanitary treatment of people requires principally mobile installations with showers and disinfection equipment for clothing and underwear.

...Not all infected patients can be hospitalized and emergency means must be improvised.

Civil defense must be oriented against attacks with BWA also by the production of sera, chemotherapeutics and antibiotics against infections which are "exotic in peace time or occur only exceptionally.

...The unusual situation created through such attacks, especially during a simultaneous BCA attack...requires unusual measures:

a) Especially accelerated epidemiological investigation for the determination of the cause of the disease (epidemic) and the availability of space for isolating and quarantining patients as well as provision for large-scale vaccination of the population together with measures for disinfection, insect extermination, and deratization;

b) Such hygenic measures as safeguarding of the potable water supplies, supplies of milk and food, and the control of sewage and garbage removal together with microbiological examination of insects and rodents

Preventive Measures

Protective vaccination is of great importance.... However, it is practically impossible to protect prophylactically either the armed forces or the entire

Descriptors

biological warfare
organization
decontamination
supplies
disinfection
insect extermination
deratization
Sanitary treatment
mobine installations
sera
chemotherapeutics
antibiotics
infections
diagnosis
treatment
tularemia
rickettsia
BWA attack
BCA attack
natural catastrophies
epidemiological investigation
disease
vaccination
hygenic measures
water supplies
milk
food
microbiological examination
preventive measures
immunity
smallpox
tetanus
typhoid
paratyphoid
plague
tularemia
cholera
brucellosis
botulism
poliomyelitis
yellow-fever

(Continued on Page 2)

Abstract (continued)

population against all infections possible in biological warfare.

The basic immunization schedule prescribes as required vaccination against smallpox, tetanus, typhoid fever and paratyphoid; and as desirable vaccination against plague, tularemia, cholera, brucellosis, botulism (types A-E), poliomyelitis (types I-III), yellow fever, encephalitis (various types), ...

...Ample utilization of antibiotics and chemotherapeutics not only therapeutically but also prophylactically.

...The enemy may use and propagate insects resistant to DDT....

Particular attention must be given to...the removal of feces and garbage.... Contamination of the ground and the water sources may have long-lasting and far-reaching consequences.

It is well-known from former wars that the retreating enemy leaves behind him infectious diseases. Accordingly, any advance of own armed forces must be preceded by a thorough examination of the area....

Epidemiological investigation will attempt to obtain a general picture of the occurrence of epidemics in the indigenous population and prisoners of war, among domestic and wild animals, on contact infections and on natural foci of infection (tularemia, encephalitis, Q-fever, etc.)

It is most important to accomplish early determination of the disease, definite diagnosis, isolation of the patients and administration of therapy. The diagnosis should be quickly made in general and further confirmed through investigation and test in the laboratory.

Descriptors (continued)

encephalitis
insecticides
garbage
animals
laboratory
civil defense
infectious diseases
epidemics
contamination
Q-fever
biological attack
virological examination
personnel hygiene
feces
prisoners of war
therapy
defense

Disease/Solid Waste
Abstracts

No. DSW-589

Author

John H. Kier, et al

Title Acute Bronchopneumonic Histoplasmosis Following Exposure to Infected Garden Soil

Reference

Jour. Amer. Med. Assoc., 31 July 1954

Doc. No.	Contract No.	Date issued
p. 1230		

Abstract

The patient revealed that about 10 days prior to the onset of his illness he had received from a local farmer a load of soil that he used in flower beds around his home. He sifted this soil in shovelfuls through an inclined screen and recalled that the soil was quite dry and dusty and contained chicken feathers. He also remembered inhaling a considerable amount of the dust.

The course of the disease was mild, but clearing of the pulmonary infiltrations was prolonged.

Indirect evidence of the relationship of H. capsulatum to the infection was obtained by skin tests, serologic tests, and mycological examination of the garden soil.

In view of overwhelming evidence that soil is the source of infections by H. capsulatum, a soil specimen was obtained from the patients flower beds on March 20, about five months after his exposure. This proved to be positive for H. capsulatum. Four months later, samples of soil were obtained from five sites on the farm of the yardman who had supplied the soil to the patient. At this same time two additional samples were gathered from the patients flower beds. One of the five samples collected at the farm and one of the two from the patients flower bed yielded H. capsulatum.

It is of interest that a neighbor exposed to garden soil from the same source also bacame ill. She was a 38-year-old housewife who received dry loam from the farmer at the same time as did the patient reported on above.

Descriptors

histoplasmosis
soil
disease
mycological examination
case
chicken feathers
skin tests
H. capulatum
flower beds
dust
seroligic tests
garden soil

Disease/Solid Waste
Abstracts

No. DSW-590

Author
Horace Donisthorpe

Title
Ants as Carriers of Disease

Reference
Entomologists Monthly Magazine, England

Doc. No. Contract No. Date issued
V. 81, 1945, p. 185

Abstract

Wheeler (1914, Amer. J. Trop, Dis., 2:160-8) pointed out that ants might well be very active agents in the dissemination of disease. After describing the feeding and other habits of ants, he writes: "It would seem to be possible, therefore, for ants to spread disease germs in three different ways: first, by simply walking over or into human food; second, by dropping into it infected hypopharyngeal pellets; and third, by contaminating it with germ-laden faeces." Wing (1940, Seminar in Entomology, Arthropods of Medical and Veterinary Importance, The medical importance of ants) enumerates what has been suggested by various authors on ants as agents in the spread of pathogenetic organisms. Experiments have been carried out to prove that ants are capable of acting as mechanical carriers of typhoid bacilli on their legs. Other experiments have been made with the pellets from their infrabuccal chamber, the "boulettes de nettoyage" of Janet; and also with their faeces. Nevertheless, I am not aware of any actual case, published or otherwise, in which ants have been proved to have been the carriers of disease. Now Mr. W. Pickles has told me of a definite and well-established case. In a letter from 72 (Br.) General Hospital, C.M.F., dated June 13th, 1945, he writes as follows: -

"A newcomer to the hospital told me rather a remarkable incident of ants acting as "vector" in the transmission of smallpox. He informed me that a Middle East hospital had a smallpox section and that, although the strictest measures were carried out to maintain isolation, fresh cases were continually being discovered in wards some little distance away. (These wards were tents.) This isolation of the smallpox compound was subjected to the strictest scrutiny and no loop-hole could be found giving a clue as to how these fresh cases were being infected. At last it was observed that ants were carrying bits of "scab" and skin from the floor of the tent away to their nests, and were taking pieces into or near other tents in doing so! Here was the cause of the infection. Not being an entomologist, my informer could not tell me the type of ant. His words were: "Just the usual ant that carries flies and seeds into the nest." I thought the incident would be of interest. If it is of real interest you may use it as you wish."

Descriptors

disease
pathogenetic organisms
case
germs
ants
smallpox
food
carriers

Disease/Solid Waste
Abstracts

No. DSW-591

Author

Morris Pollard

Title

Chemical Induction of Mammary Cancer in Germ-Free Rats

Reference

Nature, No. 4913, Dec. 28, 1963, pp. 1289

Doc. No.	Contract No.	Date issued

Abstract

Huggins et al. have described the rapid induction of breast tumours in conventional rats, following a single oral administration of 20 mg 7,12-dimethylbenz(a)-anthracene (DMBA) in sesame oil.

Female Wistar, Fischer and Sprague-Dawley rats, grem-free and conventional counterparts, were each fed 20 mg DMBA by stomach tube, on a single occasion, at 50-60 days of age. The germ-free animals were thereafter maintained in the germ-free state. Thirty-eight Sprague-Dawley rats were fed the DMBA preparation, and 13 (34 percent) of them died within 30 days .... The cause of DMBA associated deaths in germ-free and in conventional rats, was not determined. Three of 8 germ-free Wistar rats died within 20 days following DMBA feeding, and they showed no evidence of tumours at autopsy. All of 15 germ-free Fischer rats fed 20 mg DMBA, died in 15 days without showing evicence of tumour formation.

The 9 germ-free Sprague-Dawley rats which survived the treatment with DMBA developed breast tumours (one to eight per animal) on average at 82 days. Of 18 conventional Sprague-Dawley counterparts, 16 developed mammary tumours on average at 103 days; the number and distribution of tumorous glands were essentially the same as among the germ-free animals. A mammary tumour was detected in one of 5 germ-free Wistar rats at 111 days following administration of DMBA.

Mammary carcinomas were induced by orally administered DMBA in germ-free Sprague-Dawley rats, in which neither spontaneous tumours nor viral agents have as yet been detected by us. Spontaneous tumours might appera among older germ-free rats of the Sprague-Dawley strain, however, a sufficient number has not yet been accumulated on which to base such information. The findings reported here add affirmation to the concept that there are undoubtedly mutiple initiators of the same cellular alterations which lead to a neoplastic transformation, and that they may be evoked by chemical, physical, or biological agents.

Descriptors

mammary cancer
breast tumours
7,12-dimethylbenz(a)anthracene
autopsy
viral agents
neoplastic transformation
biological agents
neoplasms
rats
mammary tumours
multiple initiators
chemical agents
induction
germ free animals
(DMBA)
spontaneous tumours
cellular alterations
physical agents

Disease/Solid Waste
Abstracts

No. DSW-592

Author

C. M. Tarzwell & C. Henderson

Title

The Toxicity of Some of the Less Common

Metals to Fishes

Reference Atomic Energy Commission
TID 7517 (Pt. 1A) "Sanitary Engineering

Doc. No. Contract No. Date issued

Aspects of the AEC. Dec, 55, pp. 286

Abstract

It has been recognized for many years that some of the more common metals such as copper, zinc, lead, cadmium, and silver are extremely toxic to fishes. Many investigators have carried out a variety of experiments for the express purpose of determining the toxicity of copper to fish. Due to the fact that different fishes, different methods, and a variety of dilution waters were used, many of the results have not been in agreement.

It is now becoming more widely recognized that the quality of the receiving water is of outstanding importance, that there are synergistic and antagonistic actions among the various materials and that numerical values, based on studies of pure substances, are of little real use for indicating safe levels for aquatic life in a variety of habitats. Bio assays using the water of the receiving stream as diluent and native fish as reagents, are now being recognized as the best means for determining toxicity and establishing concentrations of wastes which are safe for fish life.

Descriptors

metals
lead
toxicity
alkalinity
CO_2
receiving water
bluegills
Cadmium chloride
Copper sulfate
Vanadium compounds
wastes
copper
cadmium
temperature
hardness
dissolved solids
receiving stream
Titanium sulfate
Nickelous chloride
Beryllium compounds
Antimony compounds
aquatic life
zinc
silver
pH
D.O.
concentrations
fathead minnows
Molybdic anhydride
Lead chloride
Zirconium compounds

Disease/Solid Waste
Abstracts

No. DSW- 593

Author

Title Agricultural Pesticides - Introduction: Guidance to Manufacturers on necessary toxicity and residue data.

Reference Council of Europe, Document prepared by the Working Party on Poisonous Substances in Agriculture, Subsidiary Organ of the Public Health Committee (P.A.) of the Council of Europe, Strasbourg 1962.

Doc. No. Contract No. Date issued

Abstract

Risks arising from the use of the chemical pesticides under consideration (workers handling crops after treatment):

Aldrin	No information
Captan	No information
Demeton-mythyl (Metasystox)	No information
Dieldrin	No information
DNOC	No information
Lindane	No information
Malathron	No information
Parathion	Due to its persistence on plants, residues can be a cause of poisoning to workers handling treated crops.
Zeneb	No information

Descriptors

agricultural particles
data sheets
analysis
properties
medical data
toxicity
application
risks
hazards
formula

Disease/Solid Waste
Abstracts

No. DSW-594

Author
Griffith E. Quinby and Allen B. Lemmon

Title
Parathion Residues as a Cause of Poisoning in Crop Workers

Reference
Journal of American Medical Association

Doc. No.	Contract No.	Date issued
Vol. 166, p. 740		15 February 1958

Abstract

From the early days of agricultural use of parathion,...it has been recognized that a potential hazard to the workmen exists "from the point of opening the bag to the ultimate possibility of a contact with material residual at thinning or suckering time."

...A 1951 outbreak which was confirmed by cholinesterase determination...33 days after application, 24 men were stripping and thinning the vines...ultimately 16 of the 24 developed symptoms and were hospitalized.

Lieben and associates[5]...mentioned that no proved illness due to skin absorption of parathion has come to the attention of the Connecticut State Department of Health among many thousands of workers, many of them children, while handling tobacco leaves containing spray residues.

...Braid and Dustan[7] carried out an excellent study of parathion residues on immature peaches. They found that residues persist far longer on the fruit (half-life of 7 to 10 days) than on the leaves (approximately 2 days)...The authors mentioned "ill-effects supposedly due to residual parathion during thinning operations." However, ...the case histories of the two persons in question were so confounded with recent heavy spray exposures in both cases and with contradictory autopsy findings in one case that their interpretation is difficult. Bobb[9] reported residues in two successive years on peach trees indicating a half-life of about two weeks on bark, but only 2% of the residue persisted on the leaves after one week.

Descriptors

- parathion
- thinning
- suckering
- hazard
- exposure
- harvesters
- workers
- residue
- crops
- spraying
- trees
- vines
- poisoning
- pears
- apples
- grapes
- citrus fruits
- hops
- absorption
- clothing
- weather
- toxic residues
- dermal

Abstract (continued)

In Marysville, Calif....three crews of 30 men each began picking pears. Two of the crews picked in areas sprayed on June 27 (12 days earlier) with 2.5 lb. of parathion per acre. The other crew picked in a block sprayed on an earlier date.

...By mid-afternoon a dozen pickers in the first two crews became ill...By evening at least 20 to 25 men had been to the hospital.

...None of the third crew picking in the orchard sprayed earlier had similar symptoms. All pickers had different lunches and different sources of water. Some ate pears; others did not.

In...British Columbia,[10]...four workers became ill after thinningin an apple orchard sprayed two days earlier with parathion.

In Riverside, Calif.,...From 16 to 19 days after ...application,...a crew of 30 men picked oranges...a total of 11 became ill...

The etiology of this group of cases might be hard to accept as parathion residues 17 days old were it not for the more completely documented episode described above, apparently due to residues 16 to 19 days old. Moreover, within the same month as the second outbreak at Riverside, a third outbreak was associated with 34-day-old residues, and another at nearby Bryn Mawr with 33-day-old residues...

Comment

...contact with pear trees, citrus trees, and grape vines caused poisoning as much as 12, 17, and 33 days, respectively, after application of parathion. In general, the episodes of poisoning involving old residues are not so well documented as those involving residues not more than two days old.

On the other hand, the episode occurring at Delano, Calif., in 1951, 33 days after the vineyard had been sprayed was thoroughly investigated, and the cause of illness was confirmed by low cholinsterase values and relief of symptoms by atropine. ...citrus fruit has been reported to retain parathion for a half-life of 60 to 80 days.

...Batchelor and Walker [15] and Culver and co-workers[16] have also shown that the skin is the principal route of absorption even during actual spraying or aerosol operations. Therefore, it seems reasonable to presume that dermal contact is more important than inhalation in explaining the exposures resulting in the poisoning described above.

The role of temperature in the etiology of these outbreaks is apparently still undetermined.

Abstract (continued)

One other exposure factor was contaminated clothing. Most of the laborers who do thinning and similar agricultural tasks wear their work clothing for about a week or longer without laundering.

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10. Black, D. M.: Unpublished data on file in the Department of National Health and Welfare of Canada, personal communication to the authors.

15. Batchelor, G. S., and Walker, K. C.: Health Hazards Involved in Use of Parathion in Fruit Orchards of North Central Washington, A. M. A. Arch. Indust. Hyg. 10:522-529 (Dec.) 1954.

16. Culver, D.; Caplan, P.; and Batchelor, G. S.: Studies of Human Exposure During Aerosol Application of Malathion and Chlorthion, A. M. A. Arch. Indust. Health 13:37-50 (Jan.) 1956.

Disease/Solid Waste
Abstracts

No. DSW-595

Author

J. Monte Johnston

Title

Parathion Poisoning in Children

Reference

Jrl. Pediatrics v42:286-291 1953

Doc. No.	Contract No.	Date issued

Abstract

Case 1. - L. D. N., a 9-month-old white female infant, just prior to noon of Sept. 21, 1951, while playing in her yard, discovered a can containing a pasty mixture of parathion and DDT which her father had discarded approximately one week previously....The infant played with the can.... The patient became comatose.... cardiac action stopped.

Descriptors

parathion	deaths
poisoning	insecticide
children	chemisttry of parathion
case history	treatment
	cholinesterase test

Disease/Solid Waste
Abstracts

No. DSW- 596

Author
Elfreda L. Caldwell and Leland W. Parr

Title
Ground-Water Pollution and the Bored
Hole Latrine

Reference
Journal of Infectious Diseases p148-183

Doc. No.	Contract No.	Date issued
Vol. 60, No. 3		May-June 1937

Abstract

...The bored latrine usually consists of a cylindrical boring 10 to 25 inches in diameter reaching to a depth of from 15 to 26 feet in order to penetrate into the ground water. This is for the purpose of obtaining septic decomposition of the fecal matter. The deliberate penetration into ground water in this type of construction is in direct contravention of the accepted hygienic viewpoint that the safe disposal of excreta should preclude contamination of water. A rigorous investigation of the occurrence and extent of contamination of ground water supply involved in its use was therefore in order.

Studies to this end were initiated early in 1929 in Covington County, Alabama, and were continued through May of 1933. Extensive investigations were carried out at eight bored latrine installations and two control plots without latrines....

The investigations presented have reference to pollution in controlled experimental fields from latrines under approximately normal conditions of family use. The latrines, 15 inches in diameter, reached into ground water flowing through unconsolidated soils where an impervious stratum closely underlay the boring and flow.

Typical B. coli and chemical products were obtained only from wells in or very near the flow of sewage from the latrine travelling with the ground water flow.

Descriptors

bored latrines
latrine
ground
fecalmatter
excreta
contamination
water
experimental fields
test wells
sewage
water flow
wells
bacterial organisms
stream characteristics
pollution flow
chemical dispersion
fecal organisms
strata
B. coli

Abstract (continued)

Wells located in the flow which consistently yielded chemical pollution but no fecal organisms emphasized the importance of "defense", which designates the processes which restricted flow from the latrine and in the filtration bed, particularly clogging of interspaces with organic aggregates.

The latrine was essentially a septic tank in immediate contact with the filtration bed. The effluent (initially a 5-foot column) containing fecal organisms and particles in suspension and chemical products in solution, issued into all strata subtended and was carried with the ground water flow toward the drainage channel, forming a pollution stream distinguishable from the normal ground water.

At all stages the intensities of characteristics lessened with distance from the source, the end point blurring gradually into the ground water. This results from dilution and oxidation of the chemical products and in addition the "filtration" of bacterial organisms....

Stream characteristics at varying depths were complexly related to velocity and position of strata in relation to latrine conditions....

Oscillation of pollution stream.- As the direction of flow of the ground water varied the flow from the latrine varied with it, resulting in shifting of the stream back and forth about the source. Therefore wells which at one time yielded gross pollution subsequently yielded slight or no perceptible pollution and vice versa....

Course and width characteristics.- (a) The pollution flow broadened due to dispersion, the branching of flow through the interspaces, and to oscillation, and then gradually converged to zero due to dilution acting upon increasingly lessened lineal concentrations. Chemical dispersion was greater than the bacterial. The maximum width of the chemical was 5 feet at 25 feet and of the B. coli was 3 feet at 15 feet, but the significant recovery at any one phase in oscillation was only 2 feet.

...The presence of fecal organisms in general coincided with the maximum concentrations of chemical characteristics. At any particular cross section of the stream as a whole, irregularities in gradation of characteristics were introduced because of variations in flow through different strata and the effect of oscillation.

...In one case in which the character of the sands suggested greater rate of flow, B. coli in greater numbers for a longer period of time were present at 25 feet but did not reach 50 feet. In a neighboring stream no B. coli were present at 25 feet though chemical pollution was gross. Latrine conditions here were responsible.

Disease/Solid Waste
Abstracts

No. DSW-597

Author
Elfreda Larson Coldwell

Title
Studies of Subsoil Pollution in Relation to Possible Contamination of the Ground Water From Human Excreta Deposited in Experimental Latrine

Reference
Journal of Infectious Disease

Doc. No.	Contract No.	Date issued
Vol.62, p. 272-292		1938

Abstract

General Summary of Findings

In this study of pollution from controlled experimental latrines under approximately normal conditions of family use, located in sands in regions where a considerable mantle of unconsolidated soils overlay the rock formation:

1. Our findings confirm the observations of others that intestinal organisms are confined to the depositary except as they are mechanically transported by other agencies, primarily fluid flow.

   A. Transportation is essentially downward with gravity flow, if soils below are pervious.

   B. Transfer by lateral capillarity is normally insignificant, but from pits subject to seepage from rains or to which considerable volumes of water are added regularly, lateral seepage will occur as percolation is retarded and liquids impounded, the area of saturation being domeshaped.

2. Significant correlation exists between moisture conditions and pollution from deposits of excreta into the subsoil:

   A. From a dry latrine (i.e., not receiving fluid other than from excreta) located in an area of high ground water of comparatively rapid flow:

Descriptors

pollution
experimental
soils
intestinal organisms
fluid
gravity
seepage
percolation
saturation
excreta
latrine
ground water
contamination
test wells
colon organisms
clogging
colloids
fecal particles
sludge

Abstract (continued)

a. There was no contamination of test wells located in the path of flow 5 feet from the pit when the water table in general was 1.5 to 2.0 feet below the pit floor and within 6 inches for a period a month after beginning use.

B. From latrines located on a cliff in an area of comparatively low ground water investigated by soil borings directly below and laterally:

a. From a dry pit latrine colon organisms did not penetrate 1 foot below or 1 foot laterally from the latrine.

b. From a pit latrine subject to seepage from rains colon organisms were carried 3 but not 4 feet below the pit and 1 foot laterally, though not in significant numbers in this instance.

c. From a pit latrine to which 100 gallons of water were added daily, colon organisms travelled 6 but not 7 fee beneath the pit and approximately 2 feet laterally, though in significant numbers only 1 foot.

3. The limitation of pollution is due to rapid "defense" - clogging of pore spaces of the soil with fine fecal particles and aggregates of colloids and organisms - which, in addition to the accumulation of sludge, retards flow and hence increases the time for the death rate of fecal organisms to operate.

Disease/Solid Waste
Abstracts

No. DSW- 598

Author
Elfreda Larson Caldwell

Title Pollution Flow From A Pit Latrine
When Permeable Soils of Considerable Depth
Exist Below the Pit

Reference
Journal of Infectious Diseases

Doc. No.	Contract No.	Date issued
Vol. 62, p. 225-258		1938

Abstract

...this paper presents aspects of an investigation of a pit privy penetrating into ground water to a depth considerably above the impervious stratum underlying the surface zone of saturation.

...The experimental pit was located in the plain along the river banks about 1300 feet from any drainage stream.

Governing conditions. - The pit privy (3 feet x 3 feet 2 inches x 8 feet 8 inches deep) was located in a controlled experimental field in the terrace plain of a drainage stream flowing at considerable distance from the pit. The slope of the water table approximated only a few inches per hundred. The pit was sunk in sands grading from fine to medium with rates of flow from 2 to 6 inches per day.

The findings.- ...a pollution stream describes a path, the resultant of the interacting forces of lineal flow with the ground water toward the discharge stream and variations in densities of the effluent flow in comparison to the ground water. It emphasized further the importance of initial and changing conditions with time.

Chemical pollution. - Specifically, the chemical pollution was traced between 325 and 350 feet by odors and p_H variations and the lineal extent through 310 feet was further checked by chemical analyses. These demonstrated strikingly the variations in intensities with distances from the source and the existence of very gross chemical pollution 80 or more feet. ...the stream in width expanded from a

Descriptors

pit privy
ground water
experimental pit
pollution stream
chemical pollution
bacterial stream
B. coli
Anaerobes
Cl. welchii

Abstract (continued)

narrow flow of 3 feet in three months to a maximum width of about 25 feet (at 80 feet) in shifting over an expanse approximating 50 feet.

The stream initially flowed with the ground water through a depth of 6 inches but shortly had dipped below the plane of the pit floor, increasing in depth expanse to 3.5 feet in 3 months and to 7 feet after 6 months. ...Within a foot of the pit the early stream (3 months) was entirely enveloped by fresh water of considerable extent, and varied in the intensity of characteristcs from midstream to upper and lower limits which merged gradually into the ground water. At termination, however, the stream was enveloped by unpolluted water only beyond 135 feet. From 20 to 80 feet the stream had sunk to the impervious stratum...

Bacterial stream. - The B. coli stream formed an inner core of less width and depth and markedly less extent than the chemical. B. coli advanced initially slightly beyond 10 feet in 3 to 4 months when restriction of flow from the pit and the clogging of the filtration bed caused regression. At termination the apex barely reached 5 feet. The B. coli stream expanded in width from 1.5 feet in the first 3 months to a maximum of 4 feet for a brief period at 5 feet after 6 months, and then rapidly contracted to less than a foot.

Anaerobes of the Cl. welchii type probably reached 50 feet in significant concentration.

Disease/Solid Waste
Abstracts

No. DSW-599

Author Brian R. Dyer , T. R. Bhaskaran,
C. Chandra Sekar

Title Investigations of Ground-Water pollution, Part III: Ground-Water Pollution in West Bengal, India

Reference Indian Journal of Medicine Res.
p23-62

Doc. No.	Contract No.	Date issued
Vol. 33		1 May 1945

Abstract

An investigation of the nature and extent of pollution flowing from a bore-hole latrine into the ground water was made... The results of the investigation may be summarized as follows:

A. Natural status of the ground water prior to seeding of the latrine:

1. Bacteriological studies showed a concentration of lactose fermenters of from 3 to 8 per 1,000 c.c. of water, almost wholly of non-faecal origin.

3. Water samples from wells above the latrine and from those not in the immediate direction of flow were examined at intervals throughout the period and the results used as an indication of the normal state of the ground water.

B. Pollution flow following seeding of the latrine:

1. The latrine was seeded with two gallons of night-soil on 330 days between November 1941 and April 1943. Septic action began in March 1942, and continued thereafter with undiminished vigour. The septic process only reached the ammonia stage. Only a fraction of the excreta added was disintegrated and at the close of the experiment there was a 2-foot column of sludge in the latrine.

2. Routine observations were made of meteorological and ground-water conditions. Annual rainfall ranged from 40 to 80 inches, and the maximum slope of the water-table was 1 in 200. Effect of seasonal changes on biological decomposition in the ground water was not pronounced.

3. Experiments on the true and false water-table near the latrine showed that the differences were not large enough to affect the flow of pollution.

Descriptors

pollution
bore-hole latrine
ground
soil conditions
experimental field
bacteriological
chemical analyses
latrine
night-soil
water-table
rainfall
decomposition
bacteriological pollution
B. coli
chemical pollution

Abstract (continued)

4. Six hundred gallons of water were pumped daily from wells situated 20 feet from the latrine in the direction of flow to simulate conditions of use of a village well.

5. Bacteriological pollution was recovered in wells 10 feet from the latrine with large numbers of B. coli found in wells in the 5-foot zone over a period of two months. Numbers diminished later and the organism was virtually absent during the final period.

6. Chemical pollution flowed with the stream to a distance of 15 feet. It was more intense in shallow than in medium or deep wells and was characterized by increase in conductivity, alkalinity, chlorides, acidity and ammonias. Nitrogenous products accounted for only a fraction of the pollution recovered.

7. Organic matter indicated by the 5-day test for B. O. D. was recovered in the 5-foot zone. It was probably colloidal in nature and was filtered out beyond that point.

8. Conductivity proved to be the most sensitive and hence the most satisfactory test for tracing chemical pollution.

9. Chrysomia larvae and their capsules were recovered from wells in the 5- and 10-foot zones where screens were damaged. They were found not only in wells in the direction of flow but all around the latrine.

Disease/Solid Waste Abstracts

No. DSW-600

Author
Alden Aust

Title
Waste Treatment in Today's Urban Era

Reference
Compost Science, V. 5, No. 3, 1965

Doc. No.	Contract No.	Date issued
pp. 24		

Abstract

There are three basic social developments which have been accentuated by urbanization that restrict the location of new industrial animal processing plants and complicate the continued operation of existing plants.

The first of these three basic developments is the growth of large concentrations of people crowded close together and often covering large geographical areas - literally hundreds of square miles in extent. Human nature being what it is, the immediate result of such crowding together is the adoption of certain mutually agreeable rules of conduct to regulate or control the activities of the group.

The second of the three basic social developments is the almost unbelievable technological advance which our society has achieved in the last 25 years. There are three realms which have a particular bearing on our discussion which I should like to mention - they are technological advances in the biological sciences; in industrial production processes including the abatement of nuisances; and in communication and transportation.

The third social development is the growing affluence, education, and cultural sophistication of our siciety. We have become much more critical of our surroundings, more demanding in our requirements for attractive communities, and almost universally intolerant of obnoxious industrial practices.

We should recognize that these legal developments have been the direct result of the social changes mentioned above; that concentrations of people have multiplied the adverse effects of industrial nuisances; and simultaneously that technological advances in recognizing, measuring, and controlling industrial nuisances have made it possible to legislate with sufficient exactitude to satisfy the courts.

These new legal restrictions or controls fall into four general categories: (1) Planning controls, (2) Public Health controls, (3) Public Safety Codes, and (4)

Descriptors

human nature
technological advancement
communication
affluence
planning controls
zoning
legal restrictions
cost
manure pile
dumping
urban society
planning
aesthetics
social developments
society
production processes
cultural sophistication
public health controls
public safety codes
sanitation
"night soil"
industrial waste
public welfare
rules
health
rules of conduct
biological sciences
transportation
education
aesthetic controls
landuse
epidemics
privy
garbage
aesthetic values
regulations
safety

Abstract (continued)

Aesthetic controls.

...The practice of zoning and landuse control have spread across the length and breadth of the land, first in large cities and metropolitan areas, then to successively smaller towns, and now down to the county and township level.

The second large body of legal restrictions, the public health controls, are familiar to you men and I will only enumerate a few in passing. Waste and sewage disposal - fantastic strides have been made in just the past 10 years. Air pollution, with a great big assist from the natural gas transmission companies, has been reduced a thousandfold. Sanitation inspection and control have almost eliminated the epidemics of yesteryear. It is true that these advances have cost industry and business great sums of money, but I doubt that anyone here would seriously advocate going back to the good old days of the "night soil" wagon, the privy, the manure pile, the open air fly-specked meat market, feeding garbage to hogs or dumping offal and other industrial wastes in the nearest ditch.

The U.S. Supreme Court, in an epoch-making decision, recently stated that "It is within legislative power to determine that a community should be beautiful as well as healthy, spacious as well as clean, well-balanced as well as carefully patrolled. The Concept of public welfare is broad and inclusive, and represents spiritual values as well as physical, and aesthetic values as well as momentary." U.S. Supreme Court, Berman v. Parker, 75S, Ct. 98, 348 U.S. 26, 99L. ed. 27.

Summarizing the legal developments, we find that planning, public health, public safety, and aesthetic regulatory legislation are all firmly entrenched in the judicial processes with more to come if industry fails to take the lead in voluntary clean up.

...There are three courses of action open.... I have over-simplified these 3 courses of action for reasons of brevity as follows: (1) The laissez-faire or do-nothing approach, (2) the self-sufficient or self-contained approach, and (3) the cooperative or good citizen approach. Let's examine these approaches.

In conclusion, let me summarize as follows: We are entering an era of intense urbanization. An urban society normally adopts much more stringent rules and regulations regarding planning, health, safety and aesthetics than a rural society, and our system of jurisprudence will enforce these rules and regulations. Therefore, it behooves industrial groups to recognize these facts and govern themselves accordingly.

Disease/Solid Waste Abstracts

No. DSW- 601

Author

S. J. Toth

Title

Agricultural Value of Dried Poultry Manure and Bedding

Reference

Compost Science, V. 5, No. 3, 1965

Doc. No.	**Contract No.**	**Date issued**
pp. 29		

Abstract

The purpose of the present study was to determine the agricultural value of artificially dried poultry manure plus bedding using various plants as test crops.

Laboratory and field tests of dried poultry manure and bedding indicate that:

1. Considerable variation can be expected in the N, P_2O_5, and K_2O contents of the final processed product. In general, however, the final product can be considered to be a 3-6-2 fertilizer.
2. A ton of processed poultry manure and bedding has about the same effect on the yields of snapbean fruit and sweet corn as 1200 pounds of a 5-10-10 fertilizer.
3. The residual value of processed poultry manure and bedding is small but was apparent in the yields of potato tubers.

Descriptors

poultry manure
fertilizer
agricultural value
P_2O_5
N
K_2O

Abstract (continued)

Table 1
Effect of Drying Temperature on Nitrogen Content of Poultry Manure and Bedding

Temperature (F°)	N Content*
	%
190	3.86
225	3.53
275	3.32
Basic Manure	4.05

*Oven-dried basis

Table 2
Variations in Composition of Different Batches of Dried Poultry Manure and Bedding

Batch	N	P_2O_5	K_2O
	%	%	%
1	3.86	6.38	1.66
2	4.09	6.84	1.44
3	4.31	6.84	1.44
4	4.30	6.84	1.87
5	3.41	6.81	2.40
6	3.08	4.12	2.83
Mean	3.84	6.30	1.97

Table 3
Partial Chemical Composition of Dried Poultry Manure and Bedding Used in Field Tests

	%
Total N	3.45
Water Soluble N	2.32
Water Insoluble N	1.13
Total P_2O_5	7.21
Available P_2O_5	4.32
Total K_2O	1.80
Water Soluble K_2O	1.71
Organic Matter	66.8
Acid-Insoluble Ash	5.7
Total Ca	6.05
pH	7.00

Disease/Solid Waste Abstracts

No. DSW-602

Author

John S. Wiley and O. W. Kochititzky

Title

Composting Developments in the United States

Reference

Compost Science

Doc. No.	**Contract No.**	**Date issued**
V.6,No.2:pgs,5-9		Summer 1965

Abstract

Combined treatment of refuse and raw sewage sludge by composting will improve the economy of the process, enahnce the decomposition, and augment both structure and nutrient content of the compost.[2,3,4] Inability to dispose of large quantities of compost at a favorable price greatly affects the economy of the process and is probably a major factor in the closing of six U.S. composting plants during 1962-1964.

Plant operators must be aware of potential hazards to health and safety inherent in processing refuse and sewage sludge. It must be demonstrated by suitable microbiological tests that pathogenic organisms which might occur in the raw wastes are destroyed by the various methods used for composting and curing. This is particularly important when raw sewage sludge is used in the process.

In normal composting, the aerobic thermophilic decomposition produces temperatures of 140 degrees Fahrenheit or higher for several hours or even days. Such a time-temperature exposure is believed to be adequate to destroy most, of rot all, pathogens. European and South African studies have consistently indicated the safety of compost produced by a number of processes.[6,7,8]

Table I shows the plants built in recent years and gives their status as of early 1965. Brief comments are given on each of the plants.

With our similar interests and varied capacities, TVA and PHS after preliminary studies, united in proposing a "Solid Wastes Composting Research and Demonstration Project" in which a full-scale composting plant would be constructed and operated at a city located in the Tennessee Valley area and the various research and development studies needed could be undertaken. The TVA Agricultural Development Division has already started experimenting with the use of compost obtained from existing plants as a soil amendment. These studies will be extended to

Descriptors

composting
treatment
refuse
sewage sludge
price
hazards
health
safety
pathogenic organisms
aerobic
decomposition
thermophilic
research
soil amendment
fertilizers

Abstract (continued)

include various uses of the basic material and of compost fortified with chemical fertilizers.

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[8] Krige, P. R. The Utilization of Municipal Wastes, Rept. No. 211, Council for Scientific and Industrial Research, Pretoria, South Africa, 71 pp, 1964.

Abstract (continued)

TABLE 1
Municipal Solid Waste Composting Plants in the United States

Location	Company	Process	Capacity Ton/Day	Began Operation	1965 Status
Altoona, Pennsylvania	Altoona FAM, Inc., Fairfield Engg. Co.	Fairfield-Hardy	45	1951 1963	Operating
Largo, Florida	Peninsular Organics, Inc., National Composters Co.	Peninsular Organics	50	1963[1]	Operating
Norman, Oklahoma	International Disposal Corp.	Naturizer	35	1959	Closed 1964
Phoenix, Arizona	Arizona Biochemical Co.	Dano	300[2]	1963	Closed 1963[3]
Sacramento Co., Calif.	Dano of America, Inc.	Dano	40	1956	Closed 1963
San Fernando, Calif.	International Disposal Corp.	Naturizer	70	1963[4]	Closed 1964
Springfield, Mass.	Springfield Organic Fertilizer Co.	Frazer-Eweson	20	1954[5]	Closed 1962
Williamston, Mich.	City of Williamston	Riker	4	1955	Closed 1962
Wilmington, Ohio	Good Riddance, Inc.	Windrow	20	1963	Operating

[1] *Date of initial operation of the original Hardy plant is unknown; plant rebuilt in 1963.*
[2] *According to European Dano practice, the plant capacity is about 175 T/day.*
[3] *Reported to be back in limited operation, March 1965.*
[4] *Date of initial operation is unknown; continuous operation began in July 1963.*
[5] *Partially burned in 1958; rebuilt in 1961.*

Disease/Solid Waste
Abstracts

No. DSW- 603

Author

James B. Reeves

Title

Studies of Sewage Sludge and Sawdust Compost

Reference

Compost Science

Doc. No.	**Contract No.**	**Date issued**
V.6,No.2,p.12		Summer 1965

Abstract

The continuing and ever-increasing use of composted sewage sludge as a fertilizer and soil conditioner has led to a deep concern over the possibilities of the transmission by such a product of diseases of an intestinal nature. The intestinal diseases most likely to be transmitted by such a compost are paratyphoid and typhoid fevers, gastro-enteritis and bacillary dysentery. The bacteria responsible for these diseases belong to the bacterial genera, Salmonella and Shigella.

Most authorities are of the opinion that composting procedures which lead to attainment of temperatures above 140° F are sufficient to destroy the intestinal disease producing organisms, especially when the termperatures of the composting mixtures are maintained above the required minimum of 140°F for a sufficiently long period of time.

Early studies had indicated that the disease producing Salmonella and Shigella were not destroyed by the termperatures reached in the sawdust-sludge type of composting mixture. The main factors influencing attainment of high temperatures in the windrows were the mositure content and the carbon-nitrogen ratio of the composting mixture. The amount of carbon in this particular type of mixture was adequate but the amount of nitrogen was negligible. Therefore, the carbon-nitrogen ratio in the composting piles was so out of balance that the mixture would not compost properly and temperatures high enough to destroy the pathogenic bacteria could not be attained. When well rotted barnyard manure in amounts varying from 5 to 50% was used as a supplement the temperatures reached in the piles were generally adequate to destroy the pathogens. Sustained temperatures in excess of 140°F are necessary for the production of a compost containing sewage sludge and sawdust which is safe for general usage as a fertilizer and soil conditioner.

Descriptors

sewage
sawdust compost
diseases
intestinal diseases
paratyphoid
typhoid fevers
gastro-enteritis
bacillary dysentery
temperatures
carbon-nitrogen ratio
pathogenic bacteria
barnyard manure
fertilizer
soil-conditioner

Disease/Solid Waste Abstracts

No. DSW-604

Author

John Leslie Beckert and Horace Roy Oakley

Title

Sewage Disposal and Refuse Composting in Leicester, England

Reference

Compost Science

Doc. No.	**Contract No.**	**Date issued**
V.6,No.1:pgs.5-8		Spring 1965

Abstract

TABLE 1 Typical Composition of Sludge and Compost

	Dried digested mixed sludge % dry matter	Composted domestic Refuse % dry matter
% Organic matter	50 - 60	38
Nitrates	3-4	0.9
Phosphates	2-3	0.8
Potash	trace	0.7

Integration of Sewage Disposal and Composting--Integration of these aspects of waste disposal was considered on two broad lines:

(a) location on adjoining sites and rationalization of management and control, and
(b) incorporation of sewage sludge in the compost.

The benefits to be obtained by locating the works on adjacent sites were limited by the decisions already taken in design of the sewage treatment works, and a separate power source was necessary for the compost plant. Duplication of offices, laboratories, workshops, telephones, and other services could be avoided, but the main advantage was in the joint disposal of sludge and compost in one common product. This offered prospect of facilitating marketing arrangements, producing a constant flow of acceptable material, and improving on either of the materials taken separately,

Descriptors

sewage disposal
refuse composting
waste disposal
management
control
sludge
treatment
marketing
analyses
organic content
dewatering
moisture content
digested sludge
economic
costs

Abstract (continued)

from the agricultural point of view. Table 1 shows, for comparison, typical analyses of dried sludge and of composted refuse, which suggests that mixing the two components would give a more balanced mineral analysis, whilst the sludge would increase the organic content of the compost.

Consideration was given to transporting liquid sludge by pipeline, or by vehicle after partly dewatering, to a compost plant site nearer the centre of the city. This would have economized on transportation of refuse at the expense of some of the advantages of a common location, and was finally rejected in favor of siting the compost plant adjacent to the sewage treatment works.

Whereas the main problem in the treatment and disposal of sewage sludge is to remove surplus water, the optimum moisture content for composting in between 50% and 60%; with household refuse water has to be added. It is well known that the whole of the wet sludge contains more water than can be utilized in composting refuse from an equivalanet population, but partial dewatering permits the right balance to be struck.

A careful analysis was made of the extent to which sludge would have to be dewatered if the whole of the refuse from Leicester were composted and mixed with the whole of the sludge arising from the treatment works. Allowing for the difference in composition of refuse in summer and winter, it was calculated that to maintain a 50% moisture content in the compost, sludge would have to be dewatered to a mean moisture content of 85% in summer and 89% in winter. If experience showed that refuse could be composted with a higher moisture content than 60% then the permissible sludge moisture content could be increased correspondingly.

These sludge moisture-contents might be achieved by consolidation of digested sludge in secondary lagoons, but this would produce a very thick sludge which would be difficult to handle and it waa thought better to provide a means of dewatering part of the sludge to a further extent and obtain flexibility by adding a mixture of dewatereed and liquid sludge in varying proportions as required.

Two main alternatives were considered:

(a) a limited area of sludge drying beds; and
(b) some form of mechanical dewatering.

Provided that a suitable and economic process was available, the latter was favored as providing a continuous and flexible means of dewatering sludge which would be independent of weather conditions.

Costs--The estimated final cost of the works described is as follows:

(One Pound = $2.80)

Sewage treatment works, excluding sludge treatment	2,100,000	
Sludge digestion and filtration......	800,000	
Refuse reception, sorting and handling......	570,000	
Composting plant and storage.......	250,000	
Total	3,720,000	Pounds English

Abstract (continued)

TABLE 1
Typical Composition of Sludge and Compost

	Dried digested mixed sludge % dry matter	Composted domestic refuse % dry matter
% Organic matter	50-60	38
Nitrates	3-4	0.9
Phosphates	2-3	0.8
Potash	Trace	0.7

Disease/Solid Waste
Abstracts

No. **DSW-** 605

Author

Dr. G. Farkasdi

Title

Do Additives Affect Windrow Composting of Refuse and Sludge?

Reference

Compost Science

Doc. No.	**Contract No.**	**Date issued**
V.6,No.1, pgs. 11-13		Spring 1965

Abstract

The results of the many experiments did not show any significant effect with the stimulating agents or inoculating agents that were used, with the exception that a trial experiment in 1959 in Heidelberg seemed to indicate a certain effect in piles treated with Edafil. An explanation of this conflicting data cannot be given at this time. It should be noted that the earlier results were based upon one trial whereas the later data were based on several repetitions.

The use of additives did not show any hygienic advantages. The destruction of pathogenic organisms occurred in equal time spans for treated and untreated piles. The increased costs and labor (of their use) would not be justified. This conclusion does not include the possible use of nutrients or additives in the composting of specialized commercial and industrial refuse that is low in microorganisms, or the inoculation of raw compost with finished compost as has been done successfully in several plants.

Descriptors

composting
refuse
sludge
experiments
inoculating agents
additives
pathogenic organisms
costs
nutrients

Disease/Solid Waste Abstracts

No. DSW- 606

Author

H. G. Schaffer

Title

And Jersey Keeps on Composting

Reference

Compost Science

Doc. No.	**Contract No.**	**Date issued**
	V.6,No.1, pgs. 14-15	Spring 1965

Abstract

Jersey, the holiday island lying between Britain and France, is now reaping the benefit of the waste conversion plant which converts both sewage and household rubbish into fertilizer. The cattle population was not sufficient to supply manure and in the absence of cereal crops, straw had to be imported with high freight charges. Fertilizers were also costly. Thus from the outset, there were two aspects to the scheme, first to ensure the conversion of all theisland's organic waste, and second, to make sure it was utilized on the land.

The output of the plant is booked for months ahead and the compost has been used to reclaim derelict land. The island's Experimental Station which reported improved crops of potatoes, tomatoes, cauliflower and all types of flowers from land treated with the compost. It was equally effective when incorporated in the soil of glasshouses. The Station also found that although the waste products coming into the plant varied considerably throughout the year, the analysis of the compost was surprisingly uniform.

The compost was found to be richer (than manure) in the trace elements, which are so essential to plant life, and it also contained several antibiotics. After the compost had been used on the land for six years, there was no build-up of metals or harmful toxic elements. There is also some evidence that the compost gives a measure of control to the eelworm or nemotode which attacks both potatoes and tomatoes. This confirms work by a number of scientist indicating that certain fungi in organic manures attack the eelworms. One Dutch research worker has reported that with a similar compost from municipal composting, nematodes swimming in a solution could be seen under the microscope to become rigid when the compost was added.

Descriptors

composting
reclaiming land
water pollution
sewage
rubbish
fertilizer
manure
costly
organic waste
utilized
soil
trace elements
plant life
antibiotics
metals
toxic elements
eelworm
nemotode
fungi
research
reclamation
wasteland
effluent
nitrogen
dumps
contamination
organic material

Abstract (continued)

The latest stage in Mr. Gruchy's work is the reclamation of wasteland. The compost is now being used to create gardens on housing sites built or virtually pure sand and aplaying field surrounded with newly planted trees has been treated with the compost and will be laid down to grass.

At first, sewage sludge was brought from the nearby sewage plant where treatment is by the normal modern processes of sedimentation bio-aeration and sludge digestion, and mixed with the compost before it passed through the fermentation cells. Now, a purified effluent, rich in nitrogen is piped to the compost plant and added to the compost.

The biggest advantage, however, is the removal of unsightly dumps and the elimination of all danger of contamination from sewage discharged into the sea. Jersey was ideal for this pioneering work, because it was possible to treat the island as a single unit and to ensure that all organic material was utilized in a single plant.

Disease/Solid Waste Abstracts

No. DSW- 607

Author

Rikard Lindstrom

Title

A Simple Process for Composting Small Quantities of Community Wastes

Reference

Compost Science

Doc. No.	**Contract No.**	**Date issued**
V.6, No.1, pgs.30-32		Spring 1965

Abstract

There is a great need for simpler, yet effective processes and plants which do not require transportation or complicated treatment. Because sewage with large quantities of water is difficult to treat, excreta, animal wastes, and other unsanitary materials should be prevented from entering sewers. An experimentally-tested process to achieve an aerobic biological change in organic wastes is described here. The key to the process is that wastes are deposited into a naturally-ventilated chamber. They then move by gravity from this chamber into a second chamber. The speed of movement is chosen so that the wastes are substantially decomposed as they reach the second chamber. A tank of impervious material such as concrete or plastic is divided by vertical partitions into two or more chambers. The upper chamber serves as a receptacle for the feces and the next one holds kitchen and garden refuse. The lowest chamber serves as storage for the finished compost.

The chambers are connected through ventilation holes in the partitions and to the outside air through air vents and a vent pipe which extends above the roof of the building. The partitions do not reach the bottom of the tank but leave open flow passages so sized that, with the slope of the bottom, a suitable downward movement of the wastes occurs.

It is possible to achieve with this arrangement an aerobic biological change in wastes of all kinds, such as excrement and refuse, with a first-class manure as an end-product. This is all done without mechanism and without the addition of chemicals or water.

Descriptors

composting
wastes
treatment
sewage
animal wastes
excreta
organic wastes
feces
refuse
manure
mechanism
chemicals
water

Disease/Solid Waste
Abstracts

No. DSW- 608

Author

H. G. Furlow and H. A. Zollinger

Title

Westinghouse Enters Composting Field

Reference

Compost Science

Doc. No.	**Contract No.**	**Date issued**
V.4,No.4,pgs.5-10		Winter 1964

Abstract

One of the nation's giant corporations, Westinghouse Electric, has entered the composting field, having signed an agreement with SACS, Inc. to construct refuse reclamation plants.

Comparison of Disposal Practices: The essential criteria for disposing of community refuse involve public health, nuisances, fire hazard, technical feasibility, costs, public support, community growth, property depreciation, and collection costs. At present, sanitary land fill, incineration, and reclamation are technically feasible.

Sanitary land fill permits disposal at low cost for relatively small communities where haulage can be kept minimal. Careful planning and control are necessary to avoid such undesirable effects as fly production, rodent harborage, nuisance complaints, water pollution, surface seepage, fire hazards, intermittent operations in inclement weather, and uncontrolled scavenging. The greatest deterrent to this method in larger communities is thatavailable sites soon become filled and new available areas bring excessive haulage costs.

Incineration entails relatively high initial and operating costs, though these are partially offset by reduced haulage charges. For optimum operation, some consideration, must be given to separating noncombustibles, controlling the size of bundles, excluding rainwater and other sources of moisture, minimizing ash, odor, and smoke discharges, and hauling noncombustible matter and quenched ashes to suitable disposal sites. Final disposal of residues must prevent fly breeding an rodent harborages. Air pollution is still a probelsm.

Reclamation plants are the most promising means of disposal, especially in metropolitan areas with high land values. They can be attractively housed and

Descriptors

composting
refuse reclamation
disposal
refuse
public health
nuisances
fire hazard
technical feasibility
costs
public support
community growth
property depreciation
collection costs
sanitary land fill
incineration
reclamation
fly
rodent
water pollution
scavenging
ash
odor
smoke
air pollution
pollution

Abstract (continued)

and require only a small amount of land, which can be used permanently for the disposal site. They can be located closer to the sources of refuse than other types, reducing hauling costs. Reclamation is the only disposal method that is completely pollution-free, and the plants are designed to reduce disposal costs through recovery of valuable products.

Disease/Solid Waste Abstracts

No. DSW-609

Author

Samuel A. Hart

Title

Sanitary Engineering in Agriculture

Reference

Compost Science

Doc. No. **Contract No.** **Date issued**

V.4, No.4, pgs. 11-15 Winter 1964

Abstract

Depending upon one's definition, there are four or five kinds of agricultural wastes: 1) livestock manures from America's 211 million head of cattle, sheep, and swine, 365 million egg laying chickens, and 2 billion fryers; 2) crop residues from 313 million acres of harvested land; 3) dead animals from ex-manure-producing livestock; and 4) agricultural chemicals-fertilizers and pesticides which are applied to crops but which persist after harvest and contaminate food, soil, and runoff water. Additionally, some people consider that runoff water and eroded soil are in themselves agricultural wastes.

The agricultural waste that creates the greatest problem today is livestock manure. Its handling and care is the principal subject of this paper.

Manure cannot usually be allowed to accumulate in the confinement area until use, because of the sanitation hazards of fly breeding, odors, dust, animal health, or potential water pollution. Therefore, four steps in the management of manure need to be considered--collection, processing, storing, and utilization or disposal.

Crop residues often create sanitation problems. This is especially true of perishable fruits and vegetables which are harvested in several pickings in the same field over a period of weeks to months. Such rotting wastes typically breed the fruit fly (Drosophila) and may spread by bacterial and fungal diseases. Crop residues such as barley and other cereal stubble, if incorporated into the soil, tie up nutrients so that succeeding crop yields are reduced. Burning is thus considered as a disposal procedure for these residues. Such burning may create air pollution problems and in some areas is prohibited.

The agricultural chemical residue problem is familiar to the nation.[14] It is a complete subject in itself, and occupies the talents of may top scientists in industrial, governmental, and academic laboratories. Research of a high level

Descriptors

agricultural wastes
manures
crop residues
dead animals
chemicals-fertilizers
pesticides
soil
runoff water
hazards
fly
odors
dust
health
collection
processing
storing
utilization
disposal
fruit fly (Drosophila)
bacterial
fungal diseases
soil
nutrients
burning
disposal
air pollution
chemical residue
research
dead-animal disposal
rendering plants
synthetic detergents
fats
sanitation
costly

Abstract (continued)

is being conducted, and education of the farmer and thepublic is assisting in solving this most difficult sanitation problem.

Dead-animal disposal is yet another agricultural wastes management problem. Rendering plants still acept large animals, although the future is not bright because synthetic detergents have reduced the market for fats.

Wastes management in agriculture is becoming an everOmore important facet of farming. As farms become larger and more specialized the need for adequate sanitation becomes greater. The sanitation engineer's talents are badly needed to assist in solving these difficult and costly problems.

References

[14] Carson, R. Silent Spring. Houghton-Miflin, Boston, 1962.

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Disease/Solid Waste Abstracts

No. DSW- 610

Author

J. W. Clark

Title

Composting Domestic Refuse in a "Home Unit"

Reference

Compost Science

Doc. No.	**Contract No.**	**Date issued**
V.4, No.4, pgs. 16-17		Winter 1964

Abstract

A composting unit was constructed from a 55 gallon steel oil drum. Using garbage from a family of four, grass cuttings, weeds, and some paper, the composter will produce about 2 cu ft of good humus every 45-60 days. The use of domestic composters such as described should reduce the cost of garbage collection, improve the fertility and soil conditions around the average home and decrease the overall health hazard.

Descriptors

composting
domestic refuse
refuse collection
disposal
costs
garbage
domestic composters
soil conditions
health hazard

Disease/Solid Waste
Abstracts

No. DSW-611

Author

John M. Bell

Title

Characteristics of Municipal Refuse

Reference Proceedings--Nat. Conf. on
Solid Waste Disposal
Am. Public Works Assoc. Special Report

Doc. No.	**Contract No.**	**Date issued**
29: pgs. 28-38		Feb.1964

Abstract

In order to learn more about the nature of this material it was essential that a reliable and standard sampling procedure be developed so that representative samples of refuse could be obtained for analysis and study. Although there had been a number of isolated studies of the physical and chemical composition of refuse, there existed no standard or fully acceptable method of sampling municipal refuse. Aware of the need for the development of such a procedure, the National Institutes of Health sponsored a project a Purdue University directed toward the development of reliable methods of refuse sampling and analysis.

In keeping with the theme of this Conference; namely, a summary of the present status of ...the art and a stimulation of research on pertinent problems in the field, the following topics will be discussed: 1) Present methods of sampling and analyzing muncipal refuse; 2) Present research; and 3) Recommended future studies. All research reported in this paper will deal with the work done at Purdue during the last six years toward the development of a practical and reliable technique for sampling and analyzing municipal refuse.

Substantial knowledge about the physical and chemical composition of refuse is essential if we are to 1) design the most effective collection methods; 2) choose the most efficient disposal systems; and 3) design this system to operate at optimum efficiency. Furthermore, as an economic aspect of the situation, it is becoming increasingly important that, as a nation, we recover all materials of possible value from our refuse. A better understanding of the chemical composition of refuse will enable us to design more efficient recovery methods for utilizing part or all of the refuse as part of a planned conservation program.

Descriptors

analysis
study
municipal refuse
chemical composition
refuse
design
collection
disposal
conservation

Abstract (continued)

Table 1

Composition and Analysis of an Average Municipal Refuse

	Per cent of total refuse	Proximate Analysis* "As received" basis, weight per cent.				Ultimate Analysis, Dry basis, weight per cent.								Btu per lb	
		Moisture	Volatile Matter	Fixed Carbon	Non-** Comb.	Carbon	Total Hydrogen	Available Hydrogen	Oxygen	Nitrogen	Sulfur	Non-** Comb.	Ratio C:(H)	Dry basis	Dry, ash-free basis
Rubbish, 64%															
Paper, mixed	42.0	10.24	75.94	8.44	5.38	43.41	5.82	(0.28)	44.32	0.25	0.20	6.00	155	7572	8055
Wood and bark	2.4	20.00	67.89	11.31	0.80	50.46	5.97	(0.672)	42.37	0.15	0.05	1.00	75	8613	8700
Grass	4.0	65.00	--	--	2.37	43.33	6.04	(0.83)	41.68	2.15	0.05	6.75	52	7693	8250
Brush	1.5	40.00	--	--	5.00	42.52	5.90	(0.75)	41.20	2.00	0.05	8.33	56.7	7900	8600
Greens	1.5	62.00	26.74	6.32	4.94	40.31	5.64	(0.77)	39.00	2.00	0.05	13.00	52.4	7077	8135
Leaves, ripe	5.0	50.00	--	--	4.10	40.50	5.95	(0.31)	45.10	0.20	0.05	8.20	131	7069	7700
Leather	0.3	10.00	68.46	12.44	9.10	60.00	8.00	(6.56)	11.50	10.00	0.40	10.10	9.1	8850	9850
Rubber	0.6	1.20	83.98	4.94	9.88	77.65	10.35	(10.35)	-	-	2.0	10.00	7.5	11330	12600
Plastics	0.7	2.00	--	--	10.00	60.00	7.20	(4.40)	22.60	-	-	10.20	13.6	14368	16000
Oils, paints	0.8	0.00	--	--	16.30	66.85	9.65	(9.00)	5.20	2.00	-	16.30	7.43	13400	16000
Linoleum	0.1	2.10	64.50	6.60	26.80	48.06	5.34	(3.00)	18.70	0.10	0.40	27.40	16	8310	11450
Rags	0.6	10.00	84.34	3.46	2.20	55.00	6.60	(2.70)	31.20	4.62	0.13	2.45	20.4	7652	7844
Sweepings, Street	3.0	20.00	54.00	6.00	20.00	34.70	4.76	(0.36)	35.20	0.14	0.20	25.00	96	6000	8000
Dirt, Household	1.0	3.20	20.54	6.26	70.00	20.62	2.57	(2.07)	4.00	0.50	0.01	72.30	10	3790	13650
Unclassified	0.5	4.00	--	--	60.00	16.60	2.45	(0.166)	18.35	0.05	0.05	62.50	100	3000	8000
Food wastes, 12%															
Garbage	10.0	72.00	20.26	3.26	4.48	44.99	6.43	(2.845)	28.76	3.30	0.52	16.00	15.8	8484	10100
Fats	2.0	0.00	--	--	0	76.70	12.10	(10.70)	11.20	0	0	0	7.2	16700	16700
Noncombustibles, 24%															
Metallics	8.0	3.00	0.5	0.5	96.0	0.76	0.04	(0.02)	0.2	-	-	99.0	51	124	12000
Glass and ceramics	6.0	2.00	0.4	0.4	97.2	0.56	0.03	(0.02)	0.11	-	-	99.3	34	65	8000
Ashes	10.0	10.00	2.68	24.12	63.2	28.0	0.5	(0.40)	0.8	-	0.5	70.2	70	4172	14000
	100.0														

Organic Analysis of Composite

	Per cent
Moisture	= 20.73
Cellulose, sugar, starch	= 46.63
Lipids(fats, oils, waxes	= 4.50
Protein, 6.25N	= 2.06
Other organic (plastics)	= 1.15
Ash, metal, glass, etc.	= 24.93
	100.00

Analysis of Composite Refuse, As Received Basis

Moisture	Carbon	Total Hydrogen	Available Hydrogen	Oxygen	Nitrogen	Sulfur	Non-Comb.	Ratio C:(H)	Btu per lb
20.73	28.00	3.50	(0.71)	22.35	0.33	0.16	24.93	39.4	4917

Btu, dry 6203
Btu, M and AF 9048

*Based on ASTM methods of analysis of coal and coke, as adapted for refuse.

**Non-combustibles-- ash, metal, glass and ceramics.

Disease/Solid Waste Abstracts

No. DSW- 612

Author

John S. Wiley

Title

A Report on Three Manure Composting Plant

Reference

Compost Science

Doc. No.	Contract No.	Date issued
V.5,No.2,pgs.15-16		Summer 1964

Abstract

Accumulations of poultry and animal manures may create nuisance and public health problems, including ordors, dust and breeding places for flies and other vermin. Manure from diseased fowl or animals may contain pathogenic microorganisms and spread them to healthy birds or animals. Plant diseases may be spread similarly since the manures may contain weed or other undesirable seeds found in the feed or beddings. This report is on three manure composting plants observed recently in Washington and California.

Chicken manure, without bedding or other carbonacious matter, is not only of poor structure for aerobic composting but is so rich in nitrogen that appreciable amounts of nitrogen are lost as ammonia during the composting process. Mr. Prohoroff reported that the compost, after several days in the drum, had a nitrogen content of about four per cent (dry basis). A pronounced ammonia odor was evident in the compost. It appears that, if carbonaceous wastes (such as, sawdust, hay, rice hulls, cotton gin trash) were added at about 1:1 with chicken manure, the moisture and NH3-loss problems would be minimized.

Descriptors

manures
nuisance
public health
odors
dust
flies
vermin
pathogenic microorganisms
plant diseases
manure composting plants
chicken manure
composting
nitrogen
ammonia
carbonaceous wastes

Disease/Solid Waste
Abstracts

No. DSW- 613

Author

Maurice Franz

Title

Large-Scale Composting in the Soviet Union

Reference

Compost Science

Doc. No.	**Contract No.**	**Date issued**
V.5,No.2,pgs.19-20		Summer 1964

Abstract

A review of Russian agricultural reports shows value of composted wastes in building soils and increasing crop yields. First--composting on all types of soil resulted in "an increase in harvest" in more than 80 per cent of 250 experiments carried out with winter wheat, rye, spring wheat, corn and potatoes." Second--through composting, one tone of manure was made to do the work of 3 and frequently did it better!

Compost containing less than 20 per cent manure actually increased crop yield more than manure when tested on rye and winter wheat.

The fact that compost frequently did better than manure in causing crop increases is constantly cited in the Godunova-Knopov report. Here is a quick tabulation of comparative results from other areas:

	Compost	Manure
Uvarovichsky (Byelorussia)	1200 lb.	1120 lb.
Eniseysky (Krasnoyarsk)	1120 lb.	720 lb.
Saldussky (Latvia)	3400 lb.	2900 lb.

At first glance, it would seem that there is little difference in gains obtained between compost and manure--a few pounds per acre. But it must be stressed that there is much less manure in the compost--that one pound of manure in the organic compost does the work of 3 pounds of uncomposted manure! Finally, the report makes it plain that such savings in manure coupled with gains in the field are reported--not from a single favored province but from all over the Soviet Union. Still one more benefit is brought about by the use of compost instead of animal manures--fewer weeds in the fields. This obviously is brought about by the heating process in composting during which temperatures can rise as high as 150 degrees fahrenheit.

Descriptors

wastes
crop yields
composting
soil
manure
weeds

Disease/Solid Waste Abstracts

No. DSW-614

Author

Casimir A. Rogus

Title

Refuse Quantities and Characteristics

Reference Proceedings-Nat. Conf. on Solid Waste Research
Am. Public Works Assoc. Special Report

Doc. No.	**Contract No.**	**Date issued**
29,pgs.17-27		Feb.1964

Abstract

The three major communal commodity services whose control is essential to life and health of any community are water, sewage and refuse. Although the quantities and characteristics of the first two have been well determined by now, those for refuse are known only partially and then only on a sporadic discontinuous basis for a relatively small number of communities. This incomplete knowledge is distressing in the face of the size and cost of this task and its influence on environmental sanitation and health of the nation. It is estimated that today's output of solid wastes totals about 250 billion pounds (about one billion cu. yds.) with collection and disposal costs approximating 2-1/2 billion dollars annually. The adverse effects on health caused by improper handling have been well established. Extensive research and many cases on record show that diseases, rodent and insect propagation fire hazards, and air and water pollution, can be traced in many instances to improper management of solid wastes. Polluted air, for instance has been demonstrated by laboratory and clinical tests to be responsible for several types of respiratory illnesses. These have been corroborated by the well publicized air pollution incidents of London, Donora, Meuse Valley, Yokahoma, Los Angeles, and New York City.

The lack of this essential information can be attributed to the following:

1. Complexity of measurement;
2. Difficulty in standardizing sampling and laboratory techniques;
3. General failure to recognize the need for this information: and
4. Geographical distribution.

It can be concluded that:

Descriptors

water
sewage
refuse
quantities
characteristics
environmental sanitation
health
solid wastes
collection
disposal
costs
diseases
research
rodent
insect
fire hazards
water pollution
respiratory illnesses
air pollution
measurement
sampling
chemical properties
hazardous wastes
analysis

Abstract (continued)

1. There now exists a lack of consistently dependable knowledge of refuse quantities and their seasonal and yearly variations and changes.
2. There is a similar lack of information as to their characteristics, and physical and chemical properties.
3. Practically no information is available on some of the newer special wastes. Among these are demolition and construction wastes, miscellaneous outsized materials, various chemical and synthetic discards, and some of the newer hazardous wastes including radioactive materials.
4. The absence of this essential information largely exists because the required overall nation-wide development of uniform standards of measurement and of analysis has not been made to date.
5. Lacking this detailed information the designs of existing facilities have been handicapped as to their effectiveness and efficiency and generally result in costlier and less sanitary operations.
6. A concentrated nation-wide effort could develop and establish the necessary information to guide improvements on existing systems and facilities and to promote more efficient future designs and operations.

Disease/Solid Waste Abstracts

No. DSW- 615

Author

Frank M. Stead

Title

Solid Waste Collection and Disposal Systems-

Ecology, Administration, Research--

Reference

Compost Science

Doc. No.	**Contract No.**	**Date issued**
V.5, No. 1, pgs.5-6		Spring 1964

Abstract

Environmental sanitation programs in the United States are based on three assumptions. The first is that unwanted waste products are best handled by discharge into the environment. The second principle then is that we can protect man at the point of exposure. The third principle is that we can take any degree of action needed to protect the public health, virtually the unlimited use of the police powers, no other considerations intervening, to avoid a disastrous effect.

The State of California is concerned with the quality of all of its water resources. The main concern is increasing mineralization--the total mineral burden on the water.

What is the principal source of water mineralization? It is not industrial wastes. The principal source is agriculture, a field in which the use of chemicals has increased the mineral content of irrigation return flows to the point where we cannot tolerate much longer their return to the water supply system.

The key to the prospect is the concept of environmental health (as distinguished from environmental sanitation), which consists of the planned management of natural resources--air, water, and land--as a total system. These are the things I foresee: At the beginning of the transition, let us say for the first five years, I see composting and the placing of the compost in a compact fill.

Secondly, I see the combining of all of the organic wastes that I have mentioned--agricultural, industrial and household--to produce a consolidated, stabilized end product that can in turn be used as a raw material for other useful products.

I see, also, changes in the design of food processing plants, an abandonment of the water carriage principle for transporting wastes, and the utilization of these wastes at the processing site, to the degree which at that time seems more intelligent.

Descriptors

solid waste
collection
disposal
ecology
administration
research
sanitation programs
environment
exposure
public health
water resources
mineralization
industrial wastes
agriculture
chemicals
irrigation
water supply
environmental health
environmental sanitation
planned management
air
water
land
composting
compact fill
transporting wastes
public interest

Abstract (continued)

But, before we can go beyond these simple steps, there are two others that must be taken: We must identify and place a price tag on this thing we call the public interest and, secondly, we must invent decision-making machinery that will taken into account all of the factors which affect the system that it is attempting to manage.

No. DSW- 616

Author

Dr. Cord Tietjen

Title

Conservation and Field Testing of Compost

Reference

Compost Science

Doc. No.	**Contract No.**	**Date issued**
V.5, No.1;pgs.8-14		Spring 1964

Abstract

From the agricultural point of view, the most important question is what effect compost has on soil improvement and crop production. Since plant nutrients are available everywhere in commercial fertilizers, the application of compost as a means of supplying nutrients has become less important for most soils under cultivation. Since compost is a soil conditioner, it is necessary to investigate the reciprocal effect of fertilizer and compost application on the biological and chemical processes occuring in the soil. This also involves soil structure, moisture content, nutrient release, and crop production. First of all, improved soil structure counteracts soil erosion.

Banse showed by field experiments in vineyards near Kreuznach that the field capacity of various soils can be increased lastingly by the application of refuse compost. In general, the following should be stressed: in 168 compost application tests, 36 per cent of the yields were significantly superior to the control, at least on the 5% level, most of them in the year following compost application. This suggests that composting time in windrows or piles should be shortened as much as possible, by transferring the organic decomposition process to plowed land by utilizing a method of sheet composting. We must learn to utilize the energy-releasing process for soil conservation and crop production under a variety of ecological conditions.

Descriptors

agricultural
compost
soil
crop production
nutrients
fertilizers
soil conditioner
soil erosion
refuse

Disease/Solid Waste Abstracts

No. DSW-617

Author

H. L. Etherton

Title

Oregon Farmers Save Money by Composting

Reference

Compost Science

Doc. No.	Contract No.	Date issued
V.5, No.1:p 20-21		Spr.1964

Abstract

Tons of screenings and other organic wastes are turned into soil conditioner for use on 1,000-acre farm. One of the main sources of waste material is screenings--a by-product of the seed cleaning mills that operate in the area. The screenings consist mainly of weed seeds and a small amount of straw. Some cleaning mills have made it a practice to dispose of their screenings by burning. Others have found that composting is the most practical and economical method to utilize this waste product.

The finished compost is now spread on garden land and orchards to a depth of about six inches. After many annual applications of this compost material, the Glaser gardens and orchards have a loose, rich, easy to work top soil that produces bumper crops without the use of any commercial fertilizers.

Descriptors

farmers
composting
screenings
organic wastes
soil conditioner
waste
weed seeds
straw
burning
top soil
crops
fertilizers

Disease/Solid Waste Abstracts

No. DSW- 618

Author

John M. Henderson

Title

Refuse Composting in India

Reference

Public Works

Doc. No.	**Contract No.**	**Date issued**
88(11):99&176-7		Nov. 1957

Abstract

Essentially cellulosic in nature, the refuse with its high carbon, negligible nitrogen and low moisture content is balanced by the night soil with its high nitrogen values and high moisture content.

Indore Process-- The basic structure used in the Indore process is a shallow open masonry pit 2 to 3 feet deep, 10 to 12 feet wide, and about 100 feet long. Night soil and mixed street sweepings and domestic refuse are placed in the pit in alternate layers each about 3 inches thick, to a depth of up to 5 feet.

The compost is turned in the pit every 15 days for 2 months, then stored on the ground beside the pit for another month without turning. The composting action is mixed aerobic-anaerobic, with aerobic action predominating following each turning.

Bangalore Process--The first step in the Bangalore process is the construction of a series of earth trenches, each 30 feet long, and originally 4 feet wide and 4 feet deep. The fresh material is placed in layers as in the Indore Process to a height about 18 inches above ground level, then eventually covered with a 6-inch layer of earth. The material is not turned and digestion under essentially anaerobic conditions is completed in 4 to 5 months. The average nitrogen value (dry solids basis) of the Bangalore compost was reported to be 2 percent, while that of the Indore compost was 1 percent.

The Health Officer of Indore reported there was no public health problem created by the agricultural utilization of the end product from either process. It may be surmised that all pathogens except possibly Ascaris eggs (round worm) are destroyed due to the combined effects of time, temperature, physical changes in the material and microbiological competition.

Applicability to the United States--The Indore or Bangalore processes and their modifications, are considered to have limited applicability in this country,

Descriptors

refuse
composting
carbon
nitrogen
night soil
Indore Process
aerobic
anaerobic
Bangalore process
public health
utilization
pathogens
Ascaris eggs
public purposes
marketing

Abstract (continued)

but might be useful in special situations. Aerobic thermophilic compost is considered to be potentially more suitable for cities, with the simpler semi-anaerobic processes described in this article being more suitable, according to Gotaas,[1] for villages and towns. Some residential communities have very large areas of public parkways, golf courses, etc., in proportion to housing areas. The use of compost for public purposes circumvents marketing problems.

References

[1] Gotaas, H. B. (1956). Composting--Sanitary Disposal and Reclamation of Organic Wastes. World Health Organization. ppbd. 205 pp.

Disease/Solid Waste Abstracts

No. DSW- 619

Author

W.A.G. Westrate, Director

Title

Refuse Composting Experience in the Netherlands

Reference

Journ of San. Eng. Div. of ASCE

Doc. No.	Contract No.	Date issued
1610 84:SA2		Apr.1958

Abstract

Currently in The Netherlands, about 25 per cent of the municipal refuse is incinerated, 50 per cent is disposed of through land fill, while the remaining 25 per cent is still processed into compost manure.

The farmers apply about 13 to 17 tons of compost for each acre of land every four years. The chemical analyses of a typical compost product is as follows:

Organic matter (excluding non-bombusted coal particles)	4.5 - 12%
Nitrogen	0.4 - 0.5%
Phosphate, soluble in mineral acid	0.4 - 0.5%
Potassium, soluble in water	0.2%
Calcium oxide, soluble in mineral acid	3.0%
Magnesium oxide ditto	0.3%
Carbon dioxide	1.5%
Moisture	30%
Loss on ignition	18 - 25%

The Netherlands agricultural land contains considerable sandy type soils, deficient in humus content, and so the addition of compost is particularly valuable for them.

Further investigations are desirable to: (1) Improve the compost treatment efficiency, (2) Ascertain the influence of various carbon-nitrogen ratios on plant growth and nitrogen fixation, (3) Study the value of using compost in conjunction with artificial fertilizer additives, (4) Learn the value of composting refuse and sewage sludge together, and (5) Determine the true economic value of such municipal compost.

Descriptors

refuse
composting
municipal refuse
incinerated
manure
humus
soils
treatment
carbon-nitrogen ratios
plant growth
nitrogen fixation
fertilizer
sludge
economic value

**Disease/Solid Waste
Abstracts**

No. DSW- 620

Author

Title

Tacoma Discontinues Composting Operations

Reference

The American City

Doc. No.	**Contract No.**	**Date issued**
73(7):35		July 1958

Abstract

Although refuse composting is successful from an economical point of view in some foreign countries, it is unable to compete with other forms of disposal in the United States.

In 1953 the City of Tacoma, Wash. initiated a series of experiments on composting refuse. These experiments have been discontinued. Although Tacoma officials felt that the cost of the composting operations was reasonable, they also felt that a continuous and profitable market of the final compost must be a ssured before production could continue. Following is a vrief summary of the composting method used by Tacoma:

1. Raw material, consisting of garbage and some sewage sludge was windrowed directly from collection trucks in rows 5 to 6 feet high.
2. Caterpillar tractors turned the material twice a week.
3. After approximately eight weeks, the entire mass was passed over a vibrating screen. Practically 100% of the composted material passed a ¼-inch screen. The remaining material consists of glass, tin cans and other more or less inert material.

Descriptors

composting
refuse
disposal
cost
market
garbage
sludge
collection

Disease/Solid Waste
Abstracts

No. DSW- 621

Author

M. S. Anderson

Title

Compost as a Means of Garbage Disposal

Reference

Proc. Florida Soil and Crop Society

Doc. No.	Contract No.	Date issued
pgs. 134-41		11-29-56

Abstract

The Bureau of the Census reports that about 64 percent of our population live in cities and smaller communities classed as urban. This means that about 100 million people in the United States produce garbage with each person contributing a daily average of about one half-pound of garbage. Thus, about 29 thousand tons per day is urban production; annual production is about 10 million tons. On a dry basis this should mean about 2.5 million tons. Garbage contains material of possible value for agriculture and, to a limited extent, for industry because of tis crude-fat content and methane-gas potential. Since garbage must be disposed of in some manner, a challenge is offered to soil and plant scientists and to munitipal officials to find economic methods of disposal. Conversion into composts and subsequent utilization for soil improvement is one of the procedures considered.

The present report includes a discussion of composting processes and a description of garbage composts collected through varied agencies. Laboratory data are presented to aid in the characterization of materials with respect to their possible usefulness for soil improvement. Some consideration is given to economic factors involved in the production and use of garbage composts.

Descriptors

compost
garbage
disposal
composition
chemical compositions
elements

Abstract (continued)

TABLE 1.—AVERAGE NITROGEN CONTENTS OF RAW GARBAGE FROM SEVERAL CITIES, DRY BASIS.

Location	Nitrogen
	percent
Washington, D. C.(1)	2.70
Hastings, New York(10)	2.20
Yonkers, New York(10)	2.50
Chicago, Illinois(1)	1.24
Savannah, Georgia(22)	1.22
Canton, Ohio(1)	2.08

Since garbage consists essentially of plant and animal products it is well to take a look at a summary of the chemical compositions of such materials. Professor E. Truog and associates of the University of Wisconsin have compiled the percentage contents of the various elements normally found in whole plants.[2] The values stated below are the percentages, dry basis, of usual occurrence, but are not necessarily average or limiting values.

Element	*Amount Present, Dry Basis* *percent*
Carbon	45
Oxygen	43
Hydrogen	6
Nitrogen	1 - 3
Phosphorus	0.05 - 1.5
Sulfur	0.05 - 1.5
Potassium	0.3 - 6.0
Calcium	0.0 - 3.5
Magnesium	0.05 - 0.7

Minor elements are designated below as parts per million (p.p.m.)

Iron	10 - 1500
Manganese	5 - 1500
Zinc	3 - 150
Copper	2 - 75
Boron	2 - 75
Molybdenum	only a trace

Somewhat less complete data covering the composition of meat products are available through the American Meat Institute(18). The approximate percentages of several elements in meat are as follows:

Element	*Content in Whole Plant* *percent*
Nitrogen	6.8
Phosphorus	.5
Potassium	.8
Calcium	.03
Iron	.01

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[2] Soils: Nature and Management, Mimeo. Lectures, Soils Dept. Univ. of Wisconsin, 264 pages. 1947.

Abstract (continued)

TABLE 2

Chemical Composition of Certain Composts Prepared Wholly or in Part from Garbage; Analyses Reported on Moisture-Free Basis.

Sample No.	Location	Total Nitrogen (N)	Phosphoric Oxide (P_2O_5)	Potassium Oxide (K_2O)	Ash	pH
		percent	percent	percent	percent	
1	California	0.44	0.12	0.38	79.2	7.5
2	New York	1.47	2.25	1.63	72.0	7.6
3	Arizona	.83	.88	.76	73.0	7.2
4	Maryland	4.11	2.98	.69	31.5	6.8
5	Georgia	1.54	.70	.80	13.7	7.8
6	Pennsylvania	.63	1.10	.22	80.6	7.4
7	Oklahoma	.92	.60	.55	68.0	8.0
8	District of Columbia ..	.98	.68	.82	75.8	7.2
9	New York	1.68	.87	.45	66.5	7.4
10	New York	.91	1.98	.65	78.0	6.3
11	East Lansing, Michigan ..	3.33	2.31	1.56	34.6	6.8
12	Lansing, Michigan ..	2.64	2.22	2.50	26.5	8.1
13	Lansing, Michigan ..	2.23	.77	.70	13.0	7.3

TABLE 3.—Nitrification Characteristics of Certain Garbage Composts Incubated at 30°C. for 4 Periods.

Sample No. and Location	Total Nitrogen (N)	Portion of Total Nitrogen Converted to Nitrate in—			
		3 Weeks	6 Weeks	8 Weeks	10 Weeks
	percent	percent	percent	percent	percent
2. New York	1.47	0.16	0.22	0.24	0.25
3. Arizona	.83	.26	.41	2.00	4.02
4. Maryland	4.11	3.42	4.12	5.08	6.20
5. Georgia	1.54	.16	1.98	3.22	3.82
7. Oklahoma	.92	1.63	2.54	2.65	3.06
8. District of Columbia ..	.98	1.79	3.14	4.12	4.41
9. New York	1.68	2.59	3.24	3.82	4.12
10. New York	.91	3.90	5.03	6.15	7.18
11. Michigan	3.33	.55	1.17	1.19	1.22
12. Michigan	2.64	.17	.47	.61	.73
13. Michigan	2.23	1.68	3.62	5.17	6.08

Disease/Solid Waste
Abstracts

No. DSW- 622

Author

Clarence G.Golueke and Harold B. Gotaas

Title

Public Health Aspects of Waste
Disposal by Composting

Reference

Am. Journ. of Public Health

Doc. No.	**Contract No.**	**Date issued**
V44:(3):339-48		Mar.1954

Abstract

The need for a practical method for refuse disposal relatively free from inherent public health hazards and yet capable of keeping pace with the economic and otherproblems engendered by a rapidly growing urban population is becoming increasingly urgent in the United States. Composting these organic wastes and using them for soil conditioners and fertilizers represents such a possibility. Some cities will soon have no disposal site available within a reasonable hauling distance. Especially serious are open dumps where flies--flourishing on exposed garbage and breeding countless new generations--are paralleled in numbers only by a well fed rodent population. Emptly tin cans offer breeding places for various mosquitoes, among which are disease vectors such as Culex tarsalis, responsible for the spread of encephalitis. Even in the sanitary land fill, which is one of the best current approaches to refuse disposal, there are significant problems in controlling odors, flies, and insects on these fills.

Incineration has often been considered the most modern method of refuse disposal. At best this method, in addition to being expensive, increases atmospheric pollution since large tonnages of material are converted to gases and particulate matter and emitted to the atmosphere. At worst it results in smoke unpleasant odors, and disagreeable air pollution. In addition, the organic humus and plant nutrients in refuse are destroyed by incineration.

Investigations of the compositing of garbage, refuse, sewage sludge, and other organic wastes as a disposal method show that in addition to reclaiming some of the materials for use as a soil conditioner and fertilizer, fly, rodent, bacterial, odor, and other sanitary problems can be reduced.

The apparent absence of health hazards is a characteristic common to all well managed composting operations in the Old World. As a result of studies

Descriptors

public health
waste
disposal
composting
refuse
hazards
soil conditioners
fertilizers
dumps
flies
garbage
rodent
mosquitoes
disease
vectors
encephalitis
sanitary land fill
odors
insects
incineration
atmospheric pollution
particulate matter
smoke
odors
air pollution
humus
nutrients
sludge
health hazards
pathogenic organisms
insect eggs
larvae
pupae

Abstract (continued)

of existing composting practices in England, the Medical Research Council was able to find no risk to human health from the manufacture of compost. Van Vuren[9] was unable to demonstrate any health hazards in properly managed composting operations in South Africa. His findings were confirmed by Dr. Blair,[10] Union of South Africa Health Department; Loots,[11] South African Department of Agriculture; Dr. Hamblin, city engineer of Johannesburg[9]; Scharff, of Malaya[9]; and others.

Experimental results, however, quite clearly indicate that a properly conducted composting operation which meets requirements of reliability, speed, and economic feasibility acceptable to Americans will be also hygiencially and aesthetically acceptable.

Table I lists the digestion at 53-54°C is very effective. Inasmuch as maximum temperatures of 70-75°C were attained in piles of composting sludge and municipal refuse, it seems safe to assume that pathogenic organisms are destroyed.

Present refuse disposal methods are generally unsatisfactory from the standpoint of health because of flies, mosquitoes, rodents, odors, and smoke associated with dumps and land fills and the air pollution which accompanies incineration.

Compost is produced by aerobic thermophilic microorganisms in 10-20 days. No inoculums are required. Temperatures in the 70-75°C range persist from 3 to 6 days during which, with proper turning of material, pathogens and insect eggs, larvae and pupae are destroyed. The final product has many characteristics beneficial both to the soil and to growing vegetation.

References

[9] Van Vuren. J.P.J. Soil Fertility and Sewage. London, England: Faber, 1949

[10] Blair, M.R. The Public Health Importance of Compost Production in the Cape. Pub. Health (Johannesburg, South Africa) 15:70, 1951.

[11] Loots, J.N. Diseases Liable to be Spread by the Present Methods of Disposal of Municipal Night Soil. Refuse and Abattoir Wastes. Ibid. (Apr.), 1943.

Abstract (continued)

Table 1—Thermal Death Points of Some Common Pathogens and Parasites

Organism
Salmonella typhosa: No growth beyond 46° C.; death within 30 minutes at 55°-60° C.[22]
Salmonella spp.: Death within 1 hour at 55° C.; death within 15-20 minutes at 60° C.[22]
Shigella spp.: Death within 1 hour at 55° C.[22]
Escherichia coli: Most die within 1 hour at 55° C. and within 15-20 minutes at 60° C.[22]
Endamoeba histolytica cysts: Thermal death point is 68° C.[30]
Taenia saginata: Death within 5 minutes at 71° C.[23]
Trichinella spiralis larvae: Infectivity reduced as a result of 1-hour exposure at 50° C; thermal death point is 62-72° C.[33]
Necator americanus: Death within 50 minutes at 45° C.[23]
Brucella abortus or suis: Death within 3 minutes at 61° C.[23]
Micrococcus pyogenes var. aureus: Death within 10 minutes at 50° C.[9]
Streptococcus pyogenes: Death within 10 minutes at 54° C.[9]
Mycobacterium tuberculosis var. hominis: Death within 15-20 minutes at 66° C.; or momentary heating at 67° C.[9]
Corynebacterium diphtheriae: Death within 45 minutes at 55° C.[9]

Disease/Solid Waste
Abstracts

No. DSW- 623

Author

Title

Composting Fizzle

Reference

Engineering News Record, p. 33, 1-16-58

Doc. No. Contract No. Date issued

Abstract

The much-publicized McKeesport, Pa., composting operation of the Organic Corp of America (Orcoa) is foundering financially and appears about to go under for good. However, its product, commercial fertilizer from decomposed garbage, has done a satisfactory job for those who bought and used it.

Orcoa's McKeesport plant began operating in July, 1956, under a 10 year contract between the company and the city which provides that Orcoa will handle all of the city's refuse and garbage for a fee to the city of $250 a month (ENR Sept. 6, 1956, p. 26). The company would keep all proceeds derived from the sale of fertilizer.

Mr. Burr, in an interview with ENR, blamed his problems on "marketing difficulties" and "competitive pressures from industry." He declined to elaborate. He did say the plant cost $450,000 to build and that Orcoa was capitalized at $1.5 million.

While the composting plant was operating, the city was satisfied. The mayor of McKeesport has estimated that the city saved $35,000 a year by turning its waste over to Orcoa.

Descriptors

composting
fertilizer
garbage
marketing
cost
waste

Disease/Solid Waste
Abstracts

No. DSW- 624

Author

T. Kay

Title

Disposal of Refuse by Composting The

Dano Plant at Radcliffe

Reference

The Chartered Municipal Engineer

Doc. No.	Contract No.	Date issued
V. 89, pg. 361,2,4		Oct. 1962

Abstract

There was general dissatisfaction with tipping as a means of disposal owing to a number of factors:

(a) shortage of suitable covering material;
(b) the progressive change in character of refuse, particularly the gradual lowering of density;
(c) shortage of suitable labour for tip attendance owing to the ready availability of more congenial and well-paid work in the area; and
(d) a general raising of standards whereby the nuisances arising from the tipping of refuse cannot easily be tolerated.

The question all along has been 'Can we dispose of the end product and for how much? In this context it should be emphasized that the process is a means of disposal of refuse and it is in this light that the scheme has been proceeded with.

Descriptors

disposal
refuse
composting
Dano Plant
tipping

Disease/Solid Waste
Abstracts

No. DSW-625

Author

Clarence G. Golueke, et. al.

Title

A critical Evaluation of Inoculums in Composting

Reference

Applied Microbiology

Doc. No.	Contract No.	Date issued
V 2: pgs. 45, 52-3		Jan. 1954

Abstract

A study was made of the effect of various inoculums on the composting of garbage and mixed municipal refuse. Garden soil, horse manure, partially decomposed organic material, and a commercial preparation of special bacterial cultures were tested in a series of experiments which were a part of an extensive study of the fundamentals of composting. No measurable effects resulted on the course of temperature, increase in percent ash, or decrease in percent carbon.

It is proposed that the nature of the composting process, and the presence of an adequate population of bacteria already existing on the material, make superfluous the addition of other bacteria.

Descriptors

inoculums
composting
garbage
refuse
soil
horse manure
bacterial cultures
bacteria

Disease/Solid Waste
Abstracts

No. DSW- 626

Author

Walter W.Rose, Jay Chapman, Walter A. Mercer

Title

Composting Fruit Waste Solids

Reference

Oregon State Univ. Eng. Exp. Station

Doc. No.	**Contract No.**	**Date issued**
Circ. 29, Sept. 63, pp. 32-63		

Abstract

The results of preliminary investigations indicate that composting offers a feasible and esthetically acceptable method for disposal of high-moisture wastes, such as fruit and vegetable solids. The following summarizes the results obtained and conclusions based on the results.

1. Dry materials, such as municipal compost, sawdust, or rice hulls, can be used to absorb the moisture from fruit waste solids and to adjust the moisture concentration of the mixture within the range optimum for high-rate composting.

2. For fruit waste-dry material mixtures, the optimum initial moisture concentration was in the range of 60 to 65 percent.

3. The maximum weight ratio of fruit to dry material successfully composted was 250 pounds of peach solids to 100 pounds of municipal compost. More optimum composting conditions were obtained when the weight of fruit was reduced to 200 pounds.

4. When peach solids were ground previous to composting, the weight ratio of fruit to dry material had to be reduced, since grinding released juices from the tissues and gave a higher initial moisture concentration for the mixture. However, under optimum conditions grinding the fruit shortened by approximately 50 percent the time required for stabilization of composted unground fruit.

5. Aerobic conditions in the compost were maintained by a turning schedule in which an initial turning was done 24 hours after layering the fruit an dry material into the compost bins, followed by daily turning for 5 to 6 days and,

Descriptors

composting
fruit waste
solids
disposal
sawdust
rice hulls
aerobic
Dano process
odors
ammonia
fly breeding

Abstract (continued)

thereafter, turning on alternate days until the process was judged to be complete.

6. The initial low pH (4.5 to 5.0) of the fruit compost mixtures appeared to be the cause of an initial lag in development of desirable microbial flora and elevation of temperature in the compost pile. Because the shortest possible composting time is an important requirement for industrial use of composting, adjustment of pH by addition of alkaline materials should be investigated.

7. Of the dry admixtures used, municipal refuse composted by the Dano process and rice hulls performed satisfactorily. Shredded redwood bark failed to adequately absorb moisture and appeared to inhibit microbial growth, probably because of the high tannin concentration. Wheat straw did not provide the necessary structural strength to prevent compaction. White pine sawdust performed adequately in absorption of moisture and maintenance of porosity in the compost pile. However, the strong buffering system in the west sawdust depressed changes in pH and prolonged acidic conditions in the compost mixture. Addition of alkaline materials makes the material more suitable for composting use.

8. With municipal compost as the dry admixture, the C/N ratio appeared to be within the range for optimum microbial development and rapid composting. With rice hulls and sawdust the fruit waste-dry material mixtures were low in nitrogen. The addition of nitrogen-rich materials, such as sewage sludge and animal manures, is indicated and should be investigated.

9. Because fruit waste solids are approximately 85 percent moisture, evaporation during composting and microbial action on carbohydrates to give carbon dioxide and water resulted in marked losses in weight and volume of the compost mixtures. Reductions ranging up to 70 and 59 percent, respectively, occurred in the initial weight and volume of the mixtures. Consequently, the weight of the air-dried compost increased only slightly when it was recycled for absorption of moisture in successive lots of compost.

10. Offensive odors did not develop in the fruit waste solids. During the initial stage of the compost process slight fruit fermentation odors were noticeable. The odor of ammonia could be detected in the final state of the process. Fly breeding in compost was not a problem. Fruit pieces exposed in the compost pile attracted flies but egg deposition was not observed.

Disease/Solid Waste Abstracts

No. DSW- 627

Author

Lynn M. Miller, et al (Task Group Report)

Title

Underground Waste Disposal and Ground Water Contamination

Reference

American Water Works Association

Doc. No.	**Contract No.**	**Date issued**
V 52:619-22		May 1960

Abstract

Many new plant facilities are being installed with provisions for nearly complete treatment of liquid wastes before disposal. In some instances, the expense of this treatment may be partially offset by the savings realized through the recovery and reuse of chemical compounds in the waste solutions. In all such instances, the costs, when amortixed over the period of plant use, indicate a savings over most disposal methods using injection or subsruface-discharge techniques.

Most wastes considered for sub-surface disposal were so objectionable that it was thought sound policy to get them out of the way by planting. The fallacy of this philosophy becomes evident when potable ground waters show evidence of contamination and demonstrate that the liquid bodies do not always stay where they are planted. It is necessary to improve on original conditions of the wastes to provide a solution that is compatible with the physical chemistry of the formation and the fluids therein. The costs usually necessitate serious consideration of the elimination of deep-well construction and the required treatment to permit surface disposal of the effluents.

In ground surface disposal, contamination results when the rate of waste application is in excess of the evaporation-transpiration requirements of vegetal cover, causing the applied waters, because of percolation, to extend beyond the limits of the disposal area.

Ponding and ground surface waste disposal continue to be the practices most hazardous to potable ground water supplies and should receive continued scrutiny.

A Journal article[2] on synthetic detergents in ground water relates the details of a study conducted in a residential area at Babylon, N.Y. Originally,

Descriptors

underground waste disposal
ground water contamination
treatment
wastes
disposal
recovery
reuse
chemical compounds
costs
injection
subsurface discharge
contamination
surface disposal
percolation
ponding
hazardous
ground water supplies
synthetic detergents
hexavalent chromium
plating plant

Abstract (continued)

attention was drawn to the area by the occurrence of hexavalent chromium contamination in one well that was situated about 400 ft from the waste discharge of a plating plant. Incidents on record indicate that syndets have traveled several hundred feet and have appeared in irrigation wells and domestic wells.

Industries and legislative bodies are becoming more aware of the problems concerned with liquid-waste disposal and ground water contamination. Standards should be developed for guides in evaluating disposal techniques and detecting unsatisfactory disposal practices. The increasing complexity of liquid wastes may require that standards be made flexible in order that they may be adapted to changing conditions.

References

[2]Flynn, J. M.; Andreoli, Aldp; & Guerrera, A.A. Study of Synthetic Detergents in Ground Water. Jour. AWWA, 50:1551 (Dec.1958).

Disease/Solid Waste
Abstracts

No. DSW- 628

Author

M. B. Ettinger

Title

Proposed Toxicity Screening Procedure for Use in Protecting Drinking-Water Quality

Reference

Jour. Am. Water Works Assoc.

Doc. No.	**Contract No.**	**Date issued**
V.52,No.6,pgs.689-94		June 1960

Abstract

There is a vast area of ignorance concerning the toxicology and pharmacology of both synthetic and naturally occurring organic materials, and new materials are being made much faster than the toxicology of known materials is being studied. The problem of keeping toxic material out of drinking water parallels that of keeping pathogenic material out. It is difficult to detail all pathogens which may conceivably be waterborne, and it is absurd to ask water utilities to check treated water for each specific organism or virus to insure that it is not present. The same is true of toxic materials.

A nonspecific analytic criterion to serve as a toxicity warning should:

1. Be suitable for execution by the water utility at a reasonable cost.
2. Afford the maximum possible protection against the intrusion of unknown or undetected toxic materials.
3. Be a criterion that all or almost all safe and acceptable water supplies can meet
4. Be based upon examination of an integrated or composite sample, as the problem is primarily one of chronic toxicity rather than acute toxicity
5. Have further value in promoting good water utility operation.

Although application of the carbon filter technique has already resulted in the detection of a number of toxic materials in water, there are toxic materials that the proposed test cannot recover. For example, it affords little protection against some of the commercial poisons which are sometimes used in large agricultural fumigation or insect control operations. The test is, however, likely to be at least a good indicator of large amounts of potentially toxic materials released as the

Descriptors

toxicity
drinking-water
toxicology
pharmacology
organic materials
pathogenic material
organism
virus
cost
protection
chronic toxicity
acute toxicity
carbon filter technique
commercial poisons
insect

Abstract (continued)

result of industrial operations, and it is possible that it will actually collect toxic materials. The proposed measurement could give a substantial amount of protection if used as a standard, and it would afford more protection than could be obtained from any other technically simple and administratively feasible test devised thus far.

Disease/Solid Waste Abstracts

No. DSW- 629

Author

Herbert E. Stokinger and Richard L. Woodward

Title

Toxicologic Methods for Establishing Drinking Water Standards

Reference

Am. Water Works Association

Doc. No.	**Contract No.**	**Date issued**
V.50:515-29		Apr. 1958

Abstract

A basis for an approach to the increasingly complex problem of developing drinking water standards is presented. It is limited chiefly to toxicologic or health considerations.

Attention is drawn to a rather large background of toxicologic information and practical health safety limits, now used in other fields, that may be advantageously used in the development of drinking water standards.

Discussed are: (1) safe limits of toxic substances in the air of industrial environments--the so-called threshold limits or maximal acceptable concentration values, (2) toxicologic information on which pesticide residue tolerances for foods are based, (3) toxicologic information developed from nutritional studies, and (4) toxicity classifications based on chemical structure relationships.

Considerable discussion is given to a variety of modifying factors that must subsequently be applied in developing a tentative standard for water--which demands more stringent requirements than the subjects of other existing health standards. Major factors of concern are the difference of susceptibility of the very young, the aged, and debilitated individuals; carcinogenic agents; and the possible modification of toxic response as a result of combinations of substances.

It is pointed out that intensified or diminished effects of combinations are apparently not common but, rather, that the response more usually is additive. Where intensification is recognized, safety factors can be included in the final standard as for other modifying factors. Chelation of metals with certain organic contaminants of streams seems to present equally great possibilities of augmented toxicity.

Descriptors

drinking water
toxicologic
health
toxic substances
threshold limits
pesticide
foods
carcinogenic agents
chelation
metals
contaminants

Abstract (continued)

TABLE 1

*Typical Drinking Water Standards**

Substance	USPHS† (1946)	Colo.	N.D.‡	Ohio§
Inorganic				
Arsenic	0.05	0.05	—	—
Barium	Not to be added	—	—	—
Cadmium	—	—	0.4	—
Chloride	250.0 R	—	—	250.0
Chromium (Cr^{6+})	0.05	0.05	2.0	2.0
Copper	3.0 R	3.0	0.4	0.4
Cyanide	—	0.5	0.15	0.15
Fluoride	1.5	—	—	—
Iron	0.3 C, R	—	—	5.0
Lead	0.1	0.1	0.35	0.35
Magnesium	125.0 R	—	—	—
Manganese	0.3 C, R	—	—	5.0
Nickel	—	—	0.5	—
Nitrate	—	—	10.0	10.0
Selenium‡	0.05	0.05	—	—
Sulfate	250.0 R	—	—	—
Zinc	15.0 R	—	1.0	15.0
Organic				
Heavy metal glucosides	Not to be added	—	—	—
Oils	—	15.0	—	None
Phenol‖	0.001 R	0.02	—	0.03

* All values expressed in parts per million.

† Key: R—recommended; C—combined values of iron and manganese.

‡ Tentative values.

§ For Miami River and tributaries.

‖ Compounds.

TABLE 2

*Limits for Inorganic Substances in Water Calculated From Threshold Limits for Air**

Substance	Absorption Factor		Limit for Water† *ppm*	Threshold Limit for Air *ppm*	Estimated Safety Factor in Water Standard†
	Inhalation	Ingestion			
Arsenic	0.2	0.8	0.6	0.5	10
Barium	0.75	1.0	2.0	0.5	—
Cadmium	0.25	0.03	4.0	0.1	—
Chromium$^{(6+)}$	0.75	0.06	6.0	0.1	3–120
Cyanide	0.6	0.8	19.0	5.0	40–125
Fluoride	0.1	1.0	1.25	2.5	0
Lead	0.2	0.2	1.0	0.2	3–10
Manganese	0.1	0.2	15.0	6.0	3–>50
Selenium	0.8	0.8	0.5	0.1	10
Vanadium	0.5	0.5	2.5	0.5	—
Zinc	0.25	0.25	75.0	15.0	5–75

* All figures approximate.

† For healthy adult.

Abstract (continued)

TABLE 3

*Limits for Organic Substances in Water Calculated From Threshold Limits for Air**

Organic Compound	Absorption Factor		Limit for Water ppm	Threshold Limit for Air mg/cu m
	Inhalation	Ingestion		
Acetone	0.5	1.0	6,000	1,000
Acrylonitrile	0.75	0.85	240	20
Allyl alcohol	0.75	0.8	55	5
Aniline	0.5	1.0	47	5
Benzene	0.35	0.4	340	25
Carbon tetrachloride	0.3	0.5	480	25
Ethylenediamine	0.75	0.8	140	10
Formaldehyde	0.8	0.8	30	5
Methyl bromide	0.3	0.5	240	10
Methylchloroform	0.1	0.5	2,700	500
Phenol	1.0	1.0	95	5
Pyridine	0.1	0.5	30	10

* All figures approximate.

TABLE 4

Relative Toxicities for Man of Inorganic Substances As Industrial Water Wastes

Substance	Toxicity*		Substance	Toxicity		Substance	Toxicity	
	Acute	Chronic		Acute	Chronic		Acute	Chronic
Aluminum	Mild	Un	Gold	Sev	Sev	Selenium	Un	Mild
Ammonium	Mild	Un	Indium	Mild	Mild	Selenates	Mod	Sev
Antimony	Mod	Sev	Iodide	Sev	Sev	Selenites	Mod	Sev
Arsenic	Sev	Sev	Iron	Sev	Un	Silicon	Un	Un
Barium	Sev	Un	Lanthanum	Mod	Mod	Silver	Mod	Mod
Beryllium	Sev	Sev	Lead	Mild	Sev	Sodium	Un	Un
Bismuth	Mod	Mod	Lithium	Sev	Sev	Strontium	Un	Un
Borates	Sev†	Mod	Magnesium	Mild	Un	Sulfur	Un	Un
Bromate	Sev	Sev	Manganese	Un	Sev	Sulfates	Un	Un
Bromide	Mild	Mod	Mercury	Sev	Sev	Sulfites	Un	Un
Cadmium	Mod	Sev	Molybdenum	Mild	Un	Tantalum	Un	Un
Calcium	Un	Un	Nickel	Mild	Sev	Tellurates	Mod	Sev
Cerium	Mod	Mod	Nitrate	Sev†	Un	Tellurites	Mod	Sev
Cesium	Sev	Un	Nitrite	Sev†	Un	Thallium	Sev	Sev
Chlorate	Sev	Sev	Osmium	Sev	Un	Thorium	Mild	Sev
Chromium	Mild	Sev	Palladium	Mild	Mild	Tin	Mild	Mild
Cobalt	Mild	Sev	Phosphorous‡	Sev	Sev	Titanium	Un	Un
Copper	Mild	Mild	Phosphates	Mild	Mild	Tungsten	Mild	Mild
Cyanide	Sev	Un	Platinum	Mod	Mod	Uranium	Mod	Mild
Fluoride	Sev	Sev	Potassium	Sev	Un	Vanadium	Sev	Mod
Gallium	Mild	Un	Radium	Un	Sev	Yttrium	Mild	Mild
Germanium	Mild	Un	Rubidium	Sev	Un	Zinc	Mild	Un
			Scandium	Mod	Mod	Zirconium	Mild	Un

* Key: Mild—Toxic effects of slight degree, such as gastrointestinal irritation; Mod (moderate)—Toxic effects of moderate to serious degree, such as injury to internal organs; Sev (severe)—Seriously debilitating effects that may end in death; Un (unimportant)—Substance essentially nontoxic or of no toxicologic concern because of reactions in water or for other reasons.

† In infants.

‡ Yellow.

Disease/Solid Waste
Abstracts

No. DSW- 630

Author

Rolf Eliassen

Title

War Conditions Favor Landfill

Refuse Disposal

Reference

Engineering News-Record

Doc. No.	**Contract No.**	**Date issued**
p.912-14		6-4-42

Abstract

War salvage campaigns have resulted in the removal of considerable quantities of paper from city refuse, and this is working a hardship on operation of incinerators. However, absence of paper favors decomposition processes, thus pointing to the special utility of landfills for refuse disposal at this time. Dr. Eliassen draws upon laboratory studies to indicate how landfill practice may be improved.

Descriptors

war
landfill
refuse
disposal
salvage
city refuse
incinerators

Disease/Solid Waste
Abstracts

No. DSW-631

Author

John R. Goldsmith and Lewis H. Rogers

Title

Health Hazards of Automobile Exhaust

Reference

Public Health Reports

Doc. No.	Contract No.	Date issued
V. 74.No.6. pgs.551-55		June 1959

Abstract

We have learned that when the nitrogen oxides and partly burned fuel of automobile exhaust are irradiated the characteristic photochemical type of smog is produced (3). Concern regarding this form of air pollution derives both from the widespread symptoms and from the possibility of immediate or long-term effects on health (4). If attention is focused on hydrocarbons and nitrogen oxides, in an effort to abate eye irritation, other adverse effects of automobile exhaust may unfortunately be ignored. This review attempts to place these other effects in perspective.

When only a few automobiles are driven on country roads, there is no public health problem, but when thousands of cars are operated in a small area with a limited supply of fresh air, automobile exhaust may constitute a potential hazard to the health of the community. This will be true even in the absence of irritated eyes and reduced visibility, so characteristic of photochemical smog.

The solution of two imperative questions lies in the future: How much exhaust can be tolerated in how much air? When does this potential hazard become an actual one? For the present, we shall concern ourselves with what is known about the constituents of automobile exhaust and with an approach to answering these questions.

Descriptors
health
hazards
automobile exhaust
nitrogen oxides
smog
air pollution
hydrocarbons
constituents

Abstract (continued)

TABLE 1. Composition of Automobile Exhaust

Constituent	Percent of concentration (volume/volume)	
	Minimum	Maximum
Aldehydes	0	0.03
Carbon dioxide	5	15
Carbon monoxide	0.2	12
Hydrocarbons	0.01	2
Hydrogen	0	4
Lead compounds	(1)	(1)
Nitrogen	78	85
Oxides of nitrogen	0	0.4
Oxygen	0	4
Sulfur dioxide	(2)	(2)
Water vapor	5	15

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[1] Depends on lead additives

[2] Depends on sulfur content of fuel

SOURCE: Reference 6 and 7

Disease/Solid Waste
Abstracts

No. DSW- 632

Author

F. H. Schraufnagel

Title

Disposal of Industrial Wastes by Irrigation

Reference

Public Health Reports

Doc. No.	**Contract No.**	**Date issued**
V.74,No.2,pgs.133-140		Feb.1959

Abstract

The two principal methods of using irrigation to dispose of waste water on the land are ridge and furrow irrigation and spray irrigation. Compared with spray irrigation, ridge and furrow systems have a higher original cost and a lower operating cost, and can handle higher volumetric loadings.

What happens to an irrigated waste? Part is evaporated, some may be transpired, and the remainder is filtered away into the ground. A relatively small amount of mineral matter is used by the vegetation, but only water is transpired and evaporated so that the soil solution will contain higher quantities of solids than were present in the original waste water. Vegetation, by transmitting water and keeping the soil loose, is important to the success of a disposal system. Excluding the runoff, excess moisture can only percolate or infiltrate the soil at some periods. Evaporation and transpiration cease at times, and precipitation, in a ddition to waste waters, must also be handled. Waste is purified by micro-organisms as it filters through the soil. Although much progress has been made in sewage treatment, we still have nothing that can produce a better effluent than the intermittent sand filter. The theory of sand filter operation indicates that the best results are achieved by giving the filtering media a chance for aeration.

In general, waste irrigation has accomplished a good degree of treatment at low cost. Adverse effects have occurred in only a few cases. Waste irrigation is not a cure-all but rather should be considered as another method of treatment that can be used when conditions are suitable.

Descriptors

disposal
industrial wastes
irrigation
ridge and furrow irrigation
spray irrigation
cost
mineral matter
soil
solids
runoff
evaporation
transpiration
micro-organisms
sand filter
aeration
treatment

Disease/Solid Waste
Abstracts

No. DSW- 633

Author

O. E. Mechem and J.H. Garrett

Title

Deep Injection Disposal well for
Liquid Toxic Waste

Reference

Journal of the Const. Div. ASCE

Doc. No.	**Contract No.**	**Date issued**
89(CO2,no.3650):111-21		Sept. 1963

Abstract

The concept of subterrean waste water disposal is not a new one. The saline waters produced simultaneously with most crude oils have prompted this method of disposal by the oil industry for a number of years. Other industries have used this method of waste elimination to solve individual problems of permanent disposal.

The design and drilling of deep disposal wells involve the adaption of techniques, practices, and equipment used in the oil industry. The conventional oilfield practices used in the evaluation and testing of reservoirs, together with the drilling and completion techniques, find application regardless of the final well purpose.

An ideal subterranean waste disposal reservoir may be defined as exhibiting the following characteristics:

1. An accumulation of rocks with sufficient pore volume to contain desired or commercial quantities of waste water under pressure available from injection facilities;
2. Sufficient permeability to accept waste water at commercial rates with available injection pressures;
3. Natural barriers at horizontal and vertical extremities of the pore volume to assure confinement of waste water within this pore volume; and
4. No natural resources within the pore volume of commercial or domestic value.

Because of the essential reservoir evaluation, the simple drilling of the hole in the ground to dispose of waste fluids is far short of the requirements of a disposal well. A number of additional considerations are mandatory in the disposal mechanism. Some of these are (1) selection of the optimum reservoir; (2) identification of reservoir fluids, and (3) the extent and effectiveness of natural vertical barriers.

Descriptors

injection disposal well
toxic waste
disposal
oils
confinement

Disease/Solid Waste Abstracts

No. DSW- 634

Author

John M. Henderson

Title

Agricultural Land Drainage and Stream Pollution

Reference

Jour. of Sanitary Eng. Div. ASCE

Doc. No.	**Contract No.**	**Date issued**
v.88(SA 6):61-74		1962

Abstract

The inherent characteristics of organic pollution contributed to agricultural land drainage by farm animals are investigated as well as whether this contribution can be a significant problem in stream pollution. The nature of abatement measures is outlined, together with their practicability and effectiveness. Human disease hazards in water-borne animal wastes are reviewed. The Potomac River drainage shed above Washington, D. C., is used as a case example. Calculations for the cited portion of the Potomac River drainage shed indicate that in 1959 the raw waste of farm animals had a population-equivalent (PE0 of over 3 million, applied to land surfaces. This PE was over 8 times that of the total human population on a human excrement basis and 4.5 times the raw domestic sewage PE. Farm animal population censuses for 1950 and 1959 showed a 5% increase in cattle population on the drainage shed and of 18% to over 135,000 cattle in the two upstream counties immediately adjoining metropolitan Washington, D. C. Thus, the fate of animal excrement after deposition on land surfaces in this case possesses important potential significance in stream pollution studies and stream pollution abatement. Limited data are cited concerning the actual BOD contribution of agricultural land drainage to a stream under flushing-flow conditions. Study and recognition of problem, process, and control methodology by soil conservation and other measures appear to have been mutually neglected by water pollution, health, and soil conservation agencies. Voids are exposed in an area of growing importance.

Although man appears to be the only animal able to biologically harbor S. typhosa in a clinical disease or carrier state, the list of infectious disease organisms for which animals other than man commonly serve as a reservoir of passive or clinical infection include fifteen human disease entities that can be contracted via the oral route and hence in theory can be water-borne. The list is composed

Descriptors

agricultural
land drainage
stream pollution
organic pollution
disease
hazards
animal wastes
excrement
sewage
animal excrement
soil conservation
health
S. typhosa
infectious disease
Bacilli
Protozoal
Rickettsial
viruses
salmonellosis
infection hazards
coliform

Abstract (continued)

of twelve species and species groups of Bacilli, two Protozcal and one Rickettsial species. Only the viruses are conspicuously absent but this is considered to be largely a result of present incomplete knowledge of many viruses in terms of human and animal infections and transmission models. With still other zoonoses, infection of man can occur by exposure of body surfaces to contaminated water. The list includes salmonellosis, with many Salmonella species and types involved (other than S. typhosa). However, lest the human disease hazards of agricultural land drainage be overdrawn, urban land drainage is considered far more important in the stream pollution-zoonoses picture than agricultural land drainage. It is appropriate, therefore, to simply label agricultural land drainage waters as "unsafe," rather than to assign them an important role in human water-borne infection hazards in this country. In some other countries, this is not the case; agricultural land drainage assumes a more important role in the transmission of infections from animal to man and from man to man. It is of interest to note that Geldreich, and others[2] reported a per-capita coliform output for cows, hogs, sheep, and ducks ranging from 2.9 to 9.3 times that of man.

References

[2] "Type Distribution of Coliform Bacteria in the Feces of Warm-Blooded Animals," by E.E. Geldreich, and others, Journal of the Water Pollution Control Federation, Vol. 34, No. 3, March, 1962, pp. 295-301

Disease/Solid Waste
Abstracts

No. DSW- 635

Author

William J. Burke

Title

Combating Health Hazards in the Chemical Industry--Part II

Reference

Chemical Industries

Doc. No.	**Contract No.**	**Date issued**
V. 55, pgs.565-68		Oct.1944

Abstract

It is the employer's responsibility to provide all the reasonable and necessary measures required for the protection of his workers. Proper medical control, i.e. the services of a full-or at least a part-time industrial physician, depending upon conditions and the number of workers involved, can institute many effective measures.

(a) Assign workers to jobs which they are physically and mentally constituted to handle properly.

(b) Examine periodically those workers who are exposed to potentially toxic materials in order to detect any early signs of injury in order that necessary remedial measures can be provided.

(c) Inform workers of any physical defects or illness of non-occupational origin requiring treatment by an outside specialist or family physician.

(d) Cooperate with the safety or plant engineering departments in the initiation of proper safeguards against exposure to harmful substances.

(e) Make arrangements with the management to be informed of all new industrial chemicals purchased or manufactured in order that they may be evaluated as to their toxicity and that proper safeguards be provided for their use.

(f) See that the first-air room is properly equipped both as to personnel and materials.

(g) Provide first-aid instructions to a select number of workers and also instruct all workers as to the value of first-aid treatment.

(h) Institute an industrial nutrition program. This should include adequate eating facilities, a proper lunch period, and a food education program.

(i) See that adequate hygienic facilities such as drinking water, washing facilities, toilets, locker rooms, etc., are provided and maintained in proper condition.

Descriptors

health hazards
chemical industry
protection
medical control
injury
illness
safety
first-air room
hygienic facilities
mechanization
education
supervision
safety rules
maintenance

Abstract (continued)

To sum up, it is the responsibility of the industrial physician to place the worker in the job for which he is best fitted and to provide the necessary medical control to protect his health while on the job.

Good engineering and safety control should not be limited to specification, design and installation of equipment, but it should also include means for the protection of workers from injurious exposures which may result in the operation of this equipment.

Mechanization of Processes--Another means for eliminating or reducing harmful exposures is the substitution of automatic or semi-automatic machinery for manual operations.

Education and Supervision--Much can be accomplished by proper education and supervision of the workers. These measures have a special significance under present operating conditions and especially in plants employing workers having no previous industrial experience. While special care should be given to instructing and supervising these new workers, it is necessary that all should have a complete understanding of actual or potential hazards associated with their work and a thorough knowledge of safe working practices. It is not only fair to the worker to inform him of the injurious nature of the chemicals handled but it is also good business: a well informed worker is usually a safer worker. Most of them can be relied upon to follow instructions, but there are always certain individuals who either knowingly or through carelessness, will at times disregard established safety rules. Such a worker is the problem-child of industry and requires more education and supervision than the average.

Maintenance and housekeeping--To allow well designed equipment capable of giving safe performance to become impaired in its operation because of lack of proper maintenance is certainly deplorable; yet this condition occurs often.

Disease/Solid Waste Abstracts

No. DSW- 636

Author

Eng. Science, Inc., Arcadia, Calif.

Title

Effects of Refuse Dumps on Ground Water Quality

Reference

State Water Pollution Control Bd., Calif.

Doc. No.	**Contract No.**	**Date issued**
Calif.State Printing Off.		Aug.1961

Abstract

As a result of the rapid population growth of metropolitan Los Angeles and the increasing urbanization of outlying areas, it has become increasingly difficult to find suitable conventient locations for land refuse disposal. The problem has further been aggravated by the abolition of all household incineration as a measure to control air pollution. Consequently the possibility of using spent sand and gravel pits, of which there are a considerable number in the San Gabriel and San Fernando valleys, has received more and more serious consideration. Because of the permeable nature of the ground in the gravel pit regions, and because many of the pits have been excavated below the ground water table, there has been just apprehension concerning the possible pollution of the ground water should any uncontrolled dumping of refuse be permitted.

The availability of close-in refuse disposal sites is evidently in the public interest, just as is a ground water supply unimpaired from its natural condition. Further, the empty gravel pits are worthless eyesores, whereas filled with refuse or any other material, their surfaces would become available for recreational, industrial, parking and other useful purposes. There is a clear need for technical information which could be used to determine under what circumstances the disposal of refuse into gravelly areas will not constitute a menace to the ground water quality.

Objectives

The principal objective of the report was to organize and review the available information concerning the effects of refuse fills on the quality of the adjacent ground water. The technical information lacking for a satisfactory understanding of how to make use of gravel pits for refuse disposal without ground water

Descriptors

refuse
disposal
incineration
air pollution
gravel pits
ground water
pollution
dumping
disposal sites
public interest
research
rubbish
constitutents
land fill
composition
trash

Abstract (continued)

degradation was thus made apparent, and a research program designed to furnish the missing facts was recommended.

Specific objectives of the report, as expressed by the State Water Pollution Control Board in Standard Agreement 12-19, were the following:

1. Assemble and collect all available information from publications and from such public and private reports that may be obtaired.

2. Analyze any available data relative to changes in composition of gases in the soil atmosphere and their movement through the ground and their absorption into ground water.

3. List the chemical, biological, hydrologic, geologic, and other factors that may affect the extent of ground water alteration by buried rubbish, clarifying the state of knowledge in each case.

4. Analyze data relating to the changes in the composition of chemical and biological constitutents of the ground water, both for situations where the ground water table is within the land fill and where the fill is above the water table.

5. Evaluate the effect of movement of water and gases through the soil on the constitutents of the air and water, respectively, with regard to adsorption, desorption, ion-exchange and similar pehnomena as they relate to water quality.

6. Analyze data relative to the rates of decomposition of organic matter in sanitary land fills under various conditions of compaction, moisture, soil content, and composition of the trash.

7. Prepare a comprehensive report of the findings and conclusions of the investigations.

Scope of Study

The search for information covered published reports on the subject of refuse disposal, papers published in the technical journals, and such unpublished data as could be obtained from public and private sources through local inquiry and by correspondence. Some fifty individuals throughout the United States in sanitary engineering and allied fields were contacted for references and information. Especially valuable sources of direct information on refuse pollution of ground water were Merz's report of studies made at the Riverside, California, sanitary fill (Reference 18), and the recent report by the British Ministry of Housing and Local Government on experimental studies of pollution by refuse dumped into wet and dry pits (Reference 33). In developing pertinent facts to the probelm at hand, it was necessary to extend the literature investigation to the fields of soil science, hydrology, physical chemistry, and biochemistry.

In presenting the acquired data and information in this report, an attempt has been made to establish all of the factors which might participate in any effects of refuse fills on the ground water, and to evaluate them individually. The data apparently lacking for a thorough appraisal of the problem have been summarized at the end of each section.

At present it is not possible to estimate reliably the rate at which carbon dioxide will be produced in buried refuse, and basic research is indicated to obtain quantitative information.

References

[18] California State Water Pollution Control Board: Report on the Investigation of Leaching of a Sanitary Landfill, Publication No. 10 (1954).

[33] Ministry of Housing and Local Government: Pollution of Water by Tipped Refuse. Report of the Technical Committee on the Experimental Disposal of House Refuse in Wet and Dry Pits, H.M. Stationery Office (1961).

Disease/Solid Waste Abstracts

No. DSW- 637

Author

Frank M. Stead

Title

Public Health Aspects of Water in California

Reference

California Water Resources Lecture

Doc. No.	**Contract No.**	**Date issued**
		1-4-66

Abstract

Mr. Stead discusses the history of water resources management in California on the basis of three periods and the manner in which the Public Health Department performed during these periods. The first period he classifies as "Water Sanitation," from 1900 to 1940, during which the emphasis was on disease prevention. The second period, from about 1940 and expected to extend, partially at least, to 1970, he called the period of Water Pollution Control. In this period the emphasis shifts from treatment at the point of use to discharges.

The third period Mr. Stead postulates will be one of Water Resource Management involving the systems analysis approach and the conservation of our limited water supply. This will require quantification of all the direct and social costs and the distribution of these costs on an equitable basis.

Descriptors

water resources
pollution
contamination
management
public health
systems analysis
environment
disease
pathogens
public interest
recreation

Disease/Solid Waste Abstracts

No. DSW- 638

Author

C. Fred Gurnham

Title

Control of Water Pollution-- Water pollution proglems can be solved by a carefully planned program of waste control and treatment.

Reference

Chemical Engineering

Doc. No. pgs.190-204

Contract No.

Date issued 6-10-63

Abstract

For most of the water requirements of civilization, we are presently limited to the fresh water that falls as rain or other precipitation on land and inland water areas. The dependable supply of this water, in the U.S., has been estimated at 314 billion gal./day. This is only slightly more than our present consumption, and far less than the 600 billion gal/day that we expect to need in 1980. We are reprieved because much of our available water is resued before its final discharge to the sea. By multiple usage, we extend the service of our water supply several times--perhaps, in the future, ad infinitum.

The limiting factor of water reuse is its purity. Every usage of water increases contamination and degrades quality--whether the usage is metabolic, sanitary, agricultural or industrial. This inevitable degradation, when it becomes objectionable, is pollution. Proper control of quality can maintain our water supply in a clean condition as it flows through multiple services beneficial to man.

Descriptors

controlling
eliminating
disposal
treatment
passive
wastes
sewage
pollution, water
rivers
sewers
injection
blending
segregation
settling
sedimentation
control, pH
oxidation
incinerating
coagulation
aerobic
treating
tests
surveys
regulations
adsorption
biological
filters, trickling
digestion
activated sludge
degradation
anaerobic
lagoons

Disease/Solid Waste
Abstracts

No. DSW- 639

Author

H. G. Hanson and Bernard B. Berger

Title

Where Does Research Stand in Water Pollution Control?

Reference

Journal WPCF

Doc. No.	**Contract No.**	**Date issued**
V.33,No. 5:477-84		May 1961

Abstract

While the research resource remains small and almost static, the problems at hand are increasing in number and complexity. As the nation grows, these problems will become even more difficult. Already they extend to every facet of the behavior and fate of a waste in receiving waters and its effects on important waster uses.

The problems are presented as questions, starting with the origin of the waste and terminating at the point of water use:

1. Can there be an accounting for all of the wastes reaching streams?
2. Can the pollutional character of new wastes be predicted?
3. Can wastes be treated adequately?
4. Is effective use made of the receiving water?
5. Can receiving waters be monitored intelligently and effectively?
6. Can polluted water be effectively treated for reuse?

Specifically, it is proposed that those in the profession formally pool their intelligence in a coordinated effort to develop a national program of research.

To sum up--population growths, industrial development, and scientific discovery itself, forecast an unprecedented and almost unpredicatable set of demands on water resources. An avalanche of wastes, old and new, will challenge waste treatment technology and water quality control as never before. Present waste treatment and water quality control resources, and their rate of development, do not appear adequate to future needs. Much is heard about "breakthroughs," mostly in the sense of scientific discovery. It is suggested that what is needed is a "breakthrough" in the magnitude of the national water pollution control research effort. The opening theme presented "questions." A question is offered to close the discussion. Will this Federation assume real leadership toward achieving such a "breakthrough?"

Descriptors

water pollution
research
behavior
waste
streams
reuse
water resources
technology
water quality control
treatment

Disease/Solid Waste
Abstracts

No. DSW- 640

Author

Title

California Zeroes In on Groundwater
Problems

Reference

Engineering News-Record

Doc. No.	**Contract No.**	**Date issued**
pgs. 32-36		10-18-62

Abstract

Groundwater pollution is a tougher problem. For one thing, knowledge is scant on many aspects of groundwater contamination. For another, degradation is usually a cumulative, insidious process. Underground waters are out of reach, moving slowly, and decades may pass before pollution is detected. Once it has occurred, it's difficult to correct and the affected aquifer may never regain its original quality.

Fundamentally, responsibility and authority for controlling water pollution is at the state level. One source of water for groundwater replenishment receiving serious attention today is reclaimed waste water--one of the most accessible potential sources for recharging underground basins.

Spurring experiments in this area is the fact that some 540 million gallons of Los Angeles County water, in the form of treated sewage effluent, is wasted to the sea every day. Methods for removing synthetic detergents, trace elements and pesticides still must be developed. The question if virus survival also must be clarified.

California groundwater complications mount up. One is subsidence, another is seawater intrusion--and both relate to groundwater withdrawal. At least 13 coastal groundwater basins in California are seriously threatened by seawater intrusion, and 70 other basins show chloride concentrations in groundwater of 100 ppm or more. Test results show that a hydrostatic fresh-water barrier will control the problem and also provide water supplies for depleted basins.

Here are some of California's latest potential hazards:

Deep-well waste disposal. Wastes too difficult or troublesome for surface disposal are dumped into a deep well where they sometimes pollute useful aquifers pierced by the well.

Descriptors

pollution
contamination
degradation
acquifier
groundwater
waste water
underground basins
treated sewage
effluent
synthetic detergents
trace elements
pesticides
virus
subsidence
seawater intrusion
chloride
fresh-water barrier
hazards
deep-well waste disposal
disposal
garbage
rubbish
chemicals
gases
weed killers
health hazards

Abstract (continued)

Disposal of garbage and rubbish. Most communities still use open dumps. When refuse burning is prohibited, the only alterntive method is the use of sanitary landfills, in which compacted refuse is dumped either in excavations or spread over low-lying land and covered with dirt.

If the bottom of the dump reaches the water table or is subject to flooding, chemicals will leach from the refuse and enter the groundwater. And even when refuse is deposited above the watertable, gases generated in the decomposing organic refuse may travel to underlying groundwaters and cause pollution.

Weed killers, pesticides. California's agricultural drainage waters contain not only large quantities of inorganic chemicals, but also the residue of organic weed killers and pesticides. This drainage pollutes streams and groundwater and creates potential health hazards. (Page 5).

Disease/Solid Waste Abstracts

No. DSW- 641

Author Jack Edward McKee and Harold W. Wolf, eds.

Title

Water Quality Criteria, 2nd Ed.

Reference The Resources Agency of Calif. State Water Quality Control Board

Doc. No.	**Contract No.**	**Date issued**
3-A		1963

Abstract

A review and critical evaluation of the technical and scientific literature or other sources of information dealing with water-quality information related to various beneficial uses of fresh and/or salt water, such as domestic water supplies, industrial water supplies, irrigation stock and wildlife watering, the propagation of fish and other aquatic or marine life, recreational use, and navigation.

1. A collation and evaluation of up-todate water-quality standards or requirements embodied in and applied through ordinances, legislation, and the rules and regulations of state and interstate agencies dealing with water pollution.
2. A review and critical evaluation of literature reporting original research to establish deleterious concentrations of potential pollutants for specific beneficial uses of water.
3. A survey of recent technical papers dealing with dilution, mixing, tidal actions, purification mechanisms in surface and ground waters, synergism, antagonism, and other factors that may influence the application of water-quality criteria to individual problems of water pollution.
4. Findings, conclusions, and recommendations from which the State WPC Board can promulgate guidelines of water quality for specific beneficial uses.
5. Recommendations for further investigations and/or research into water-quality problems.
6. A final report, including a bibliography o reference material, consisting of a manuscript ready for printing.

Descriptors

toxicants
chemicals
bacteria
virus
pesticides
syndets
water-quality
domestic water supplies
industrial water supplies
irrigation
water-quality standards
ordinances
legislation
rules
regulations
water pollution
research
dilution
mixing
tidal actions
purification
mechanisms
ground waters
synergism

Disease/Solid Waste
Abstracts

No. DSW- 642

Author

Lee McLemore

Title

Houston Sets up Research Program for Wastes

Reference

Compost Science

Doc. No.	**Contract No.**	**Date issued**
V.6,No.1, pgs. 9-10		Spring 1965

Abstract

In any event, sanitary fills depress the surrounding real estate, causing slum areas and undesirable development, thereby causing a loss in tax revenue. Incineration has been greatly improved in the past few years for the control of fly ash, rodents, and odors, subject to air and water pollution control, so that today modern incineration can take care of the average garbage needs in most localities. There still remains the ashes, which must be landfilled.

Landfill, as we have previously stated, is not desirable in low, flat areas where the water table is so close to the ground, such as in the Houston area. It is our suggestion that landfill be used only for solid materials, such as building materials, brick, rocks, and ashes from our incinerators. Such landfill sites will be abandoned sand pits, ravines, and other areas where reclaiming such areas could and would restore land values suitable for residential or commercail development.

Compost, or other mechanical methods. The majority of the Committee believe these mthods, although new in America, merit a esearch and development program. Dompost does eliminate odors, rodents, flies, and provides a useful soil-building product that is marketable.

Descriptors

sanitary fills
real estate
slum areas
tax revenue
incineration
fly ash
rodents
odors
air pollution
water pollution
garbage
ashes
landfill
water table
solid materials
land values
compost
research
flies
soil-building

Disease/Solid Waste Abstracts

No. **DSW-** 643

Author Francis Clay McMichael and Jack Edward McKee

Title

Report on Wastewater Reclamation at Whittier Narrows

Reference W.M. Keck Lab--Cal.Inst.Tech.
also, State Water Quality Control Board,
Sacramento, Calif.

Doc. No.	**Contract No.**	**Date issued**
		9-30-65

Abstract

The general objective of this investigation has been to determine the effects of intermittent percolation through soil of highly treated activated-sludge effluent on the quality of ground water in the Whittier Narrows area. More specifically, theproject was designed to study the fate of significant mineral, organic, and biological constituents of renovated wastewater and the phenomena associated with their removal or transformation.

The principal findings and conclusions resulting from this investigation are summarized as follows:

1. The effluent discharged from the Whittier Narrows Water Reclamation Plant from April 1963 through April 1965 met all of the requirements promulgated by Regional Water Pollution Control Board No. 4.

2. This effluent also met all of the mandatory chemical standards of the U. S. Public Health Service Drinking Water Standards of 1962 and almost all of the recommended (i.e. non-mandatory) chemical standards. The only chemical analyses that failed to meet the non-mandatory standards of the USPHS were total dissolved solids (500 mg/l limit), ABS (0.5 mg/l limit), and nitrogen if it later becomes oxidized to nitrate (10 mg/l limit as N). Tests for carbon chloroform extract were not run by this project. Physical and biological parameters are discussed later in this summary.

3. The Whittier Narrows effluent contains less total dissolved solids and much lower sulfates than does Colorado River water, which is the alternative supply purchased for spreading.

4. From January 1963 through February 1965, the LACFCD spread 193,515 acre

Descriptors

percolation
soil
activated-sludge effluent
ground water
constituents
wastewater
chemical
nitrate
dissolved solids
sulfates
reclaimed water
chlorides
ABS
drying
aeration
colloids
LAS
BOD
COD
coliforms
fecal streptococci

Abstract (continued)

feet of Colorado River water, 33,640 acre feet of local water, and 28,373 feet of reclaimed water, for a total of 255,528 acre feet. Hence, the reclaimed water constituted only about 11.0 percent of the total water spread. Expressed otherwise, the reclaimed water was subjected to a dilution of more than eight to one by natural waters in the process of spreading and subsequent underground mixing.

5. The best analyses for tracing changes in water quality in this investigation appeared to be chlorides, sulfates, and ABS. Local ground water upstream from Whittier Narrows Dam and the rising water in Mission Creek are characterized by 10 to 30 mg/l of chlorides, 20 to 160 mg/l of sulfates, and no apparent ABS. Natural Colorado River water has about 95 mg/l of chlorides, about 310 mg/l of sulfates, and no apparent ABS. Reclaimed wastewater at Whittier Narrows has about 115 mg/l of chlorides, about 128 mg/l of sulfates, and during this investigation about 1.8 mg/l of ABS. Hence, the spreading of Colorado River water should produce a significant rise in chlorides and a large increase in sulfates, but no trace of ABS. The spreading of wastewater should have about the same influence on chlorides but considerably less impact on sulfates, or perhaps none at all. Where it is not subject to much adsorption or biodegradation, ABS can signal the presence of wastewater.

6. Well No. 2936, upstream from Whittier Narrows Dam and apparently not influenced by Colorado River water released to the Rio Hondo or the San Gabriel River, is low in chlorides (14 mg/l or less) at depths of 36 to 81 feet, moderate in sulfates, low in nitrates, and free from apparent ABS. Wells no. 1590D, 1950F, 1590M, 1600L, 1592A, and 1592X, all in or near the Rio Hondo Spreading Grounds exhibit concentrations of chlorides and sulfates closely approaching those of Colorado River water, a condition that reflects the spreading of large volumes of Colorado River water since 1952. Insofar as chlorides are concerned, the multiple-depth sampler revealed no significant stratification. Nitrates are low and there is no evidence of ABS within the limits of reliability of this test (i.e. P.2 mg/l). In view of the fact that wastewater effluent is diluted over 8 to 1 by other water and ABS is readily removed by intermittent percolation in aerobic soil, it was highly unlikely that any impact of wastewater on the quality of water beneath the spreading grounds could be detected. None of the water from wells sampled in this investigation showed any tendency to foam.

7. The shallow toe-drain wells at the downstream edge of Whittier Narrows Dam occasionally showed concentrations of apparent ABS in excess of 1.0 mg/l in fall and winter seasons but not in spring and summer. None of these samples of high ABS concentrations, however, produced any foam when shaken vigorously. There is no intentional spreading of wastewater efluent upstream from the Dam (except for the small volume at Whitter Narrows Test Basin), but some reclaimed water may reach the shallow ground-water table from the unlined transport canals.

8. The hydraulic performance of the well-ripened Whittier Narrows Test Basin has been phenomenal. In the latter part of the investigation, 2.0 feet of effluent was applied every day (except Saturdays and Sundays) at about 4:00 P.M. The bed was generally dry in less than 10 hours and was subject to aeration for

Abstract (continued)

the remainder of each 24-hour period. The average rate of infiltration, measured by the rate of change of a stage recorder, was 1.45 feet per day during the first month of operation, decreased in the first five months to 0.59 feet per day, and then began a spectacular rise, reaching 5.20 feet per day in August 1964, decreasing slightly during the next winter, but rising again with warmer weather. It is apparent, therefore, that the intermittent daily application of highly treated activated-sludge effluent not only failed to cause plugging of the basin but actually improved the infiltration capacity markedly. The reasons for this spectacular performance were not explored to satisfaction, but it is hypothesized that biological growths within the basin forced the soil structure to open somewhat and to remain open during periods of drying and aeration.

9. Much of the improvement in hydraulic acceptance at the Whittier Narrows Test Basin occurred immediately after the bed received a six-inch layer of pea gravel. It is believed that the turbulent flow through the pea gravel served to flocculate the colloidal solids in the activated-sludge effluent, with most of the agglomerated material being removed by and oxidized on the surfaces of the pea gravel or the top surface of the soil. Hence, the pea gravel prevented colloids from penetrating and plugging the soil.

10. The hydraulic performance of Rio Hondo Test Basin was somewhat less than satisfactory, considering that initially it had a higher infiltration capacity than did the Whittier Narrows Test Basin. This difference is attributable to three factors: (a) the Rio Hondo Test Basin did not receive nearly as much organic load or nutrient, (b) it was flooded continuously for seven days at a time and allowed to dry for 14 days for about six months midway in the experiment, and (c) it was not coated with pea gravel. Owing to the less-favorable circumstances under which the Rio Hondo Test Basin operated, most of the observations reported below are based on performance at the Whittier Narrows Test Basin.

11. Prior to the start of this investigation in January 1962, the belief was widely held that the portion of ABS surviving conventional activated-sludge treatment was resistant to biochemical degradation. This study, however, demonstrated conclusively that, under favorable aerobic conditions, a well-ripened intermittent spreading basin can decrease the concentration of resistant ABS to 0.2 mg/l or less in a few feet of vertical percolation and that about 97 percent of the removed ABS is degraded biochemically.

12. In partially ripened columns of medium-coarse sand in the laboratory, each only 26 inches deep, about 57 to 60 percent of the ABS was removed and degraded biochemically; whereas for the new LAS, the removal and degradation totalled 89 to 91 percent. With further ripening and perhaps with finer sand the percentages for both detergents would probably improve, but this study was sufficient to show that the new LAS is considerably more amenable to biochemical degradation than the former ABS. Parenthetically it should be noted that the detergent manufacturers completed their conversion from ABS to LAS prior to foam separation formerly averaged about 3.7 mg/l of apparent ABS. By September 1965 this concentration had dropped to about 1.5 mg/l owing to the biodegradability of the new LAS.

Abstract (continued)

13. Although the conventional 5-day 20°C BOD of the final effluent at Whittier Narrows is characteristically less than 10 mg/l, the long-term BOD (e.g. 30 to 100 days) is in the order of 150 mg/l. More important, in a well-ripened spreading basin, this high total oxygen demand is exerted within a few hours in percolation through the upper two to four feet of soil. Expressed otherwise, the supposedly well-oxidized activated-sludge effluent exerts an oxygen demand of about 150 mg/l in percolating through the first few feet of ripened soil.

14. The long-term or total biochemical oxygen demand equals the chemical oxygen demand plus the oxygen required to convert ammonia and organic nitrogen to nitrates. This value can be computed from rapid chemical tests without waiting for 30 to 100 days of incubation.

15. In a well-ripened spreading basin, the nitrogeneous oxygen demand is exerted more rapidly and more completely than the carboneous oxygen demand. For the Whittier Narrows effluent, the nitrogeneous demand is more than four times the carbonaceous demand. Insofar as oxygen balances are concerned, it would be desirable to spread an activated-sludge effluent in which the nitrogen was already in the form of nitrates.

16. Approximately three quarters of the carbonaceous oxygen demand, as measured by COD, is removed from thepercolating water in passage through the first four feet of a well-ripened intermittently operated basin. This is a zone that is highly aerobic. Below the four-foot level, however, the COD increased again to about 40 percent of the surface concentration. It is hypothesized that this increase in a zone that is frequently anaerobic is attributable to the growth of soil bacteria and their presence in the percolate, as described under item 19 which follows.

17. The COD of the soil in the upper two meters of the well-ripened Whittier Narrows Test Basin was more than five times the COD of the effluent added to the basin during the entire recharging operation. It is apparent, therefore, that much of the carbonaceous and nitrogeneous residue in the activated-sludge effluent is being converted to biological growth in the basin, and indeed that the organisms are getting supplementary nutrients from carbon dioxide, bicarbonates, and possibly atmospheric nitrogen. Whatever the mechanism, the basin appeared to function as a tremendously efficient biological system.

18. The sum of organic and ammonia nitrogen is dimished by more than 95 percent in percolation through the upper two feet of well-ripened soil. Further percolation to eight feet does not increase this percentage, nor is there a measurable reconversion back to organic nitrogen or ammonia. Most of the total nitrogen applied to the basin can be accounted for as nitrates in the percolates at various depths.

19. Nitrates in the percolate from undiluted effluent at Whittier Narrows exceed the recommended limit of the USPHS Drinking Water Standards by a factor of two to three. Natural ground waters in this area generally contain less than one quarter of the USPHS limits. Consequently it is desirable that effluent be

Abstract (continued)

diluted with natural waters prior to spreading (as is presently being done) or that ample opportunity be afforded underground for percolated effluent to blend with natural ground waters before subsequent repumping.

20. Contrary to the findings of previous investigators that vertical travel through four to seven feet of soil removed almost all coliform organisms from the percolate, this project demonstrated that a well-ripened bed generates coliforms as well as myriads of other bacteria. The median MPN of the chlorinated applied effluent was only 190 coliforms per 100 ml, yet the percolates at the four sampling pans produced median MPN concentrations in the order of 1,000 to 20,000 per 100 ml. In all probability, these bacteria were removed by deeper percolation or by lateral travel in the zone of saturation.

21. Further tests revealed that the coliforms in the percolates were of non-fecal origin, i.e. they were normal soil bacteria that thrived on the nutrients in the effluent and in the environment created by intermittent operation. Confirmation tests for fecal coliforms with the EC medium gave negative results consistently. On the other hand, fecal streptococci were found occasionally in the percolates at all sampling pans, but in very low concentrations. It is concluded, therefore, that vertical percolation through a well-ripened bed is an effective method for removing bacteria of fecal origin, despite the heavy growths of coliforms of soil origin.

22. Limited virological analyses indicated that the density of enteric viruses in wastewater from the San Gabriel Valley is quite low (i.e. less than 100 PFU per liter) except possibly during summer and early fall months, and during massive feedings of Sabin oral polio vaccines. Samples taken during and shortly after the Sabin Oral Sunday inoculations of February 1963 showed about 250 PFU of enteric viruses per liter in the Whittier Narrows effluent but no measurable concentration in the percolate from the two-foot pan. A subsequent addition of Sabin Type-III vaccine to the effluent applied to the Whittier Narrows Test Basin failed to produce measurable concentrations of enteric viruses in the percolates.

23. In the recharge of ground-water basins by surface spreading of wastewater effluents, there are two primary objectives, viz,

a. to obtain the highest possible rate of hydraulic acceptance so as to minimize the land area required for spreading, and

b. to schieve an optimum degree of tertiary treatment so that the percolated water will be suitable for subsequent beneficial uses.

24. The objectives in item 23 can best be achieved by maintaining a highly aerobic environment in the spreading basin. To do so requires intermittent application of the effluent in a manner that will optimize the reaeration of the soil.

25. With the cycle of operation employed ultimately at the Whittier Narrows Test Basin (i.e. application of two feet of effluent per day, about nine hours wet and 15 hours dry), the total oxygen demand of the effluent was in the order of 75 to 100 gms of oxygen per square meter per day, mostly from the oxidation of ammonia and organic nitrogen. Diffusion of air from the surface during a half

Abstract (continued)

day of dryness alone appears to be capable of supplying about 110 grains of oxygen per square meter. Undoubtedly the piston effect of the percolating water will draw into the soil even more oxygen. The dissolved oxygen in the applied water is a negligible factor. For cycles longer than one day, the total oxygen demand of the applied water exceeds the reaeration capacity of the soil. Loading half as much effluent twice a day would be even more favorable than daily loading of the full amount, but practical considerations might preclude this method of operation.

Disease/Solid Waste
Abstracts

No. DSW- 644

Author

J. E. McKee

Title

Dimensions of the Solid Waste Problem

Reference Proceedings--Nat. Conf. on
Solid Waste Research
Am. Public Works Assoc. Special Report

Doc. No.	**Contract No.**	**Date issued**
29; pgs. 1-7		Feb. 1964

Abstract

This conference is concerned with solid wates from all three sources, supposedly to the exclusion of liquid and gaseous wastes. Yet, we cannot divorce our thinking from air and water pollution, for often the method of handling one form of waste creates problems in the other forms. The backyard burning of refuse, for example, creates serious air pollution. A sanitary landfill, as another example, may possibly cause degradation of ground-water quality. Furthermore, the household grinding of garbage turns a solid-waste problem into a liquid one. Although this conference is oriented primarily toward solid wastes, let us remember that the problem must be considered in its broad context.

First, it is essential to establish the proper responsibility for the collection and disposal of domestic solid wastes. Research into public administration on this subject may be indicated. Furthermore, the methodology of collection, disposal, salvage, etc. will depend to a large extent on whether the responsibility lies with government or with the individual householder teamed up with private enterprise. Second, it is important to recognize that many of the problems of solid waste are associated with small communities, often unincorporated. Research on the solid-waste problems of large metropolitan areas may have little or not applicability to towns of 10,000 population or less. Let us not overlook this phase of the problem.

There have been no epidemics attributable to improper handling or disposal of solid wastes. While there is ample reason to belive that the insanitary handling handling of solid wastes contributes to endemic disease, there have been no Donoras or Broad Street wells to dramatize the problem. It is difficult to reduce the problems of solid wastes to clear-cut scientific or engineering investigation, because the conomic and political factors are so overpowering.

Air pollution is a definite hazard to health and it may be a by-product of

Descriptors

solid wastes
sanitary landfill
refuse
air pollution
ground-water
grinding
garbage
collection
disposal
solid wastes
research
salvage
endemic disease
economic factors
political factors
air pollution
hazard
health
trash
incineration
fire
water pollution
leachings
gases
composting
market
soil conditioner
manure
sewage sludge
fertilizers
conservation
general public
public health
environmental health
costs

Abstract (continued)

certain practices in the collection and disposal of solid wastes. In the absence of adequate collection and enforced rules against burning, much of the trash of a community may be converted into gaseous pollutants by inefficient combustion. Where central municipal or industrial incineration is employed, the increment to atmospheric pollution may still be significant. Corollary to the backyard incineration of refuse is another hazard to health, namely uncontrolled fire. This hazard also arises from the improper storage of refuse.

Water pollution may also be an adjunct of solid waste storage and disposal. Leachings from the accumulation of solid agricultural products have been known to pollute surface streams. Sanitary landfills, furthermore may pollute nearby ground waters either by direct leachings or even by the diffusion of gases of decomposition through the soil. These problems are being investigated at present in California.

None of the foregoing problems of public health are acute or dramatic; but they are definitely real. None are likely to produce an epidemic or gross contamination of water or air; but they may contribute markedly to endemic disease and they certainly lead to a general degradation of the environment.

It is difficult at this time to consider that composting and agricultural utilization of the compost will soon become an economic system of solid-waste disposal. There is no sizable market for compost from solid wastes and none is likely to develop in the near future. Los Angeles County, for example, has a tremendous surplus of organic soil conditioner, owing to the fact that its resident bovine population is much greater than that of any other county. Los Angeles County is truly the nation's No. 1 "cow county". As a result, manure is sold very cheaply. Digested sewage sludge cannot compete with the deluge of bovine manure, so obviously composting is out of the question at this time. In other sections of the country, chemical fertilizers make composting uneconomic. We should not, however, ignore the potentialities of composting. The time may well come in a few decades when the USA is no longer an area of crop surpluses and when many of the conservation measures used now in Europe will be required here. For this reason, it is prudent to continue research on composting.

The pressure for more action and more research in solid-waste handling may well arise from the general public before it develops from public-health officials, economists, engineers, or conservationists. The public is definitely willing to pay more for service that is demonstrably better. The public would like to sweep the solid-waste problem under the rug or put it behidn a door; but recognizing that these alternatives are not available, the public wants convenience and cleanliness. It is wiilng to pay more if the results are clearly superior. Smart politicians recognize this tendency and try to capitalize on it. As engineers and scientists in environmental health, we too should aim toward optimum convenience to the public, even if the costs are somewhat greater than minimum.

Disease/Solid Waste
Abstracts

No. DSW- 645

Author

E. Paul Taiganides

Title

Agricultural Solid Wastes

Reference Proceedings--Nat. Conf. on
Solid Waste Disposal
Am. Public Works Assoc. Special Report

Doc. No.	**Contract No.**	**Date issued**
29: pgs. 39-50		Feb. 1964

Abstract

The trend in livestock production is to automation. This is particularly exemplified by the recent history of confinement rearing of poultry and swine. During the last few years, many of the problems associated with livestock and poultry production within a confined area have been satisfactorily solved. Consequently, many farmers are changing from pasture to pen confinement. In this manner, the full advantages of central feeding, push-button operation and small land area use per animal can be better utilized.

The largest single problem in confinement production involves manure handling and disposal. The odor and fly nuisance of manure, the large quantities produced daily, the decline of manure as a competitive fertilizer and the encroachment of urban areas to production units complicate the problem of livestock and poultry waste handling, treatment and disposal.

If the population equivalent figures as given by Eby (5) for hogs, 1.9, cattle, 16.4 chicken, 0.014, are applied to the 1961 population totals given in Table 1, the wastes from the swine, chicken and cattle alone are equivalent to 10 times the wastes from the human population of the United States and 100 times greater than the wastes from the rural human population.

In summary, it can be stated that most of the feed ingredients of the animals will be excreted in the feces and urine. The amount of each feed constitutent found in manure depends upon the size and kind of animal, its condition (laying hen vs. broilers, or milking cow vs. a steer), On the basis of these parameters, the quantity and composition of manure can be estimated theoretically (21).

Although many of the problems associated with the control of the animal environment in a confinement unit have been solved satisfactorily or are being

Descriptors

confinement
automation
manure
disposal
odor
fly
fertilizer
refuse
feces
urine
quantity
composition
field spreading
lagoons
composting
sludge digestion
methane
irrigation
farm waste
treatment
characteristics
chemical residues
chemical properties
analysis

Abstract (continued)

researched intensively, no really satisfactory method of manure treatment and disposal has been advanced. The main methods of disposal which are being practiced in the United States include field spreading, lagoons and composting. In other parts of the world, sludge digestion with methane recovery and sprinkler irrigation are also being tried.

The variety of farm waste disposal methods advanced indicate that no one method has been found satisfactory. This lack of one or more generally accepted methods of manure disposal is due to the inherent limitations of the methods practiced, the lack of experimental data on these methods and to some extent on the variability of conditions from one farm to the next.

Theproblems associated with farm waste handling, treatment and disposal have been compounded with the recent trend in confinement rearing of livestock and poultry production. Livestock and poultry confinement housing units with population equivalents of 10,000 to 20,000 are already in existence, and their number is steadily increasing. Furthermore, the lack of engineering information on manure disposal, the encroachment of urban areas to previously rural regions, the scarcity of land for disposal and the characteristics of the manures themselves complicate theproblem of agricultural waste managememt.

Although manure disposal is perhaps the number one problem in livestock production, there are five other distinct sources of agricultural wastes whose handling and disposal can be just as problematic. These include human wastes from the rural population, crop residues, wastes from rural industries, agricultural chemical residues and disposal of 30 million dead birds from poultry production units.

The physical and chemical properties of the farm manures were reviewed and guide values for the major properties were presented. An analysis of the present methods of manure disposal showed that no really satisfactory method of farm waste disposal has been advanced. The farmer is willing, more than he generally accepted, to adopt new ideas to combat the waste disposal problem. However, new ideas are slow in coming from the engineers and scienticsts in the field.

References

[5] Eby, H. J., "Manure Lagoons, "Agricultural Engineering, 43:698-701, 714. 1962.

[21] Taiganides, E. P., "Characteristics and Treatment of Wastes from a Hog Confinement Unit," Unpublished Ph.D. thesis, Ames, Iowa, Library, Iowa State University, 1963.

Abstract (continued)

Table 2
Some Infectious Diseases Common to Animals and Man*

Disease	Animals Affected	Mode of Infection
Actinomycosis	All domestic animals	Chewing contaminated straw, etc.
Brucelosis	All domestic animals	Direct contact & consumption of contaminated dairy products
Gas Gangrene	All domestic animals	Infection of wounds
Glanders	Horses, mules	Contact
Leptospirosis	Swine, cattle, rats, dogs	Contact - swimming in infected water
Swine Erysipelas	Swine, turkeys, sheep	Infection through skin
Tetanus	All domestic animals	Contact - wounds or manure, filth
Tuberculosis	Cattle, swine, fowl	Contact and ingestion
Pox	Cattle, horses	Contact
Q Fever	Cattle, sheep	Inhalation of contaminated dust
Rabies	All domestic animals	Bite or wound
Newcastle Disease	Chicken, Turkeys	Infected fowl or careless handling of vaccines

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* *Taken from Midwest Farm Handbook (15).*

Disease/Solid Waste Abstracts

No. DSW- 646

Author

Walter A. Mercer

Title

Industrial Solid Wastes: The Problems of the Food Industry

Reference Proceedings--Nat. Conf. on Solid Wastes Disposal
Am. Public Works Assoc. Special Report

Doc. No.	**Contract No.**	**Date issued**
29:pgs. 51-64		Feb. 1964

Abstract

It is evident, even now, that the future processing of fruits and vegetables will be in segregated, centralized areas and in plants equipped with push-button mechanization. Regardless of the degree of centralization and automation in food growing and processing, the amount of inedible solid refuse can change little in proportion to edible portions of the raw food. At the field and at the processing plant we can only expect greater accumulations of wastes whose proper disposal or utilization will demand the best efforts of engineers, bio-scientists, and all who are concerned with environmental health problems.

For example, within the fertile Central Valley of California we can now see the battle line forming between grasping acquisition of the land for urban development and its retention for growing the foods we need. Last year the farmers of the Valley produced over 5 million tons of raw foods for commercial processing. From this tonnage, the canners in the area packed more than 87 million cases of food. This production represents 60 and 80 percent, respecively, of the vegetable and tree fruit products packed in the nation.

Each year 700,000 to 800,000 tons of tree fruits are grown in California's Central Valley. Nearly all of this tonnage goes to canneries for processing. Between 12 and 14 percent of this raw tonnage becomes a waste material consisting of pits, peels, green fruit, and defective pieces not suitable for canning.

Some small percentage of the tomato waste is now dehydrated for this purpose; but this is a diminshing use since pesticide residues have been shown to be concentrated in the skin of the tomatoes.

Fruit refuse is 80 to 90 percent water. Dehydration would be extremely costly even though a feasible method of pressing and drying the waste could be developed. Pesticide residues concentrated in the peel are, again, a problem.

Descriptors

centralization
automation
food growing
processing
solid refuse
wastes
disposal
utilization
environmental health problems
food waste solids
dumped

public health
spread
pests
flies
insects
air pollution
incineration
land-fill disposal
composting
treatmenteducational program

health
economic aspects

Abstract (continued)

Because utilization of food waste solids is not economical and otherwise feasible at this time, the remaining alternative is disposal of the wastes in the most economical way which complies with present public health and other regulations.

Presently much of the solid waste materials from the canning of fruits and vegetables are dumped or spread on land. Nuisance conditions created by this method of disposal are the cause of increasingly severe criticism from regulatory agencies and complaints from the public. The breeding of pests, flies and other insects of agricultural significance, in the accumulated refuse are reported to cause economic losses of yet undetermined seriousness. The pesticidal spray programs used in attempts to control the insect population are cause for worry regarding the increasing level of resistance of the insects to killing by pesticide.

Heightened regard for stream and ground water purity has given rise to justifiable doubts about land-fill disposal of these high-moisture solids. Because of the air pollution aspects and wet nature of the refuse, incineration can no longer be considered as means of disposal.

A survey of other possible methods of disposal for these wastes indicated that high-rate aerobic composting should be investigated.

Long-range forecasting must attempt to predict what changes the future will bring in the occurrance, handling, and disposing of wastes. Such information has unlimited value to industries, such as food processing, in locating and designing future plants. Many future difficulties could be prevented if adequate information were available on which to plan waste treatment facilities for these operations.

The canning industry believes that the Public Health Service through the Solid Wastes Engineering Section of the Division of Environmental Engineering and Food Protection is the proper agency for developing and disseminating the information so urgently needed. To this end the following recommendations are made:

1. All necessary support should be given, to the appropriate agency in the Public Health Service, for the development of technical and administrative staffs adequate in number and ability to meet the critical needs for action in solid waste disposal.
2. Central and regional research centers must be established for implementing a solid wastes engineering research program with location priority given to those areas judged to have the most urgent problems.
3. The scope and intensity of research on solid wastes disposal must be expanded through grants and contracts awarded to qualified institutions preferably located in areas where these problems are most acute.
4. Every effort should be made to enlist the technical assistance and good will of industries producing solid wastes and to support research in qualified laboratories of these industries.
5. When adequate information is available, an educational program should be designed to emphasize the health and economic aspects of improper disposal of solid wastes and should be directed to the citizen, his governmental representative, and the producers of solid wastes.

Disease/Solid Waste
Abstracts

No. DSW- 647

Author

Walter R. Lynn

Title

Systems Analysis for Solid Waste Problems

Reference Proceedings--Nat. Conf. on Solid Wastes Disposal
Am. Public Works Assoc. Special Report

Doc. No.	**Contract No.**	**Date issued**
29, pgs.69-74		Feb. 1964

Abstract

In general the techniques of systems analysis deal with problems in which it is desired to maximize or minimize some objective which is subject to a set of requirements or constraints. The analytical methods are primarily mathematical and solutions frequently require the use of electronic computation equipment. The mathematical methods used for systems analysis are usually catagorized as being in the area of "mathematical programming."

There are many solid waste problems to which systems analysis can make a significant contribution. Some possible avenues of research can be illustrated by presenting questions which will require answers in order to obtain efficient operations of solid waste disposal systems.

1. Should collection vehicles originate and terminate in the same location?
2. Where should transfer stations be located? (This problem is an extension of the problem which Charnes et al are studying since household collections will be required independently of the transfer operations, but other factors must also be considered.
3. What combinations of solid waste processing methods will result in a minimum cost when constraints exist on the disposal sites or processing methods?
4. What kind of processing methods should be developed or which existing methods should be improved to obtain maximum return for the dollars invested?
5. When solid waste processing and disposal are required, where should these operations be located.

Descriptors

systems analysis
requirements
constraints
mathematical methods
solid waste
research
disposal
collection
vehicles
transfer stations
processing methods
cost

Abstract (continued)

The above are but a sampling of the many questions which require useful answers in order to achieve efficient operations.

In summary, systems analysis provides a tool for examining complex interrelated municipal activities and the solutions obtained by these methods provide a sound basis for reaching decisions. These analyses are not an end in and of themselves but rather are intended to serve the end of efficient and effective decision-making. Although some of the techniques used in these approaches may be abstract and mathematically complex the prime motivation for the analysis is to obtain useful results and solutions.

Disease/Solid Waste Abstracts

No. DSW- 648

Author

F. R. Bowerman

Title

Transfer Operations

Reference Proceedings--Nat. Conf. on Solid Wastes Disposal
Am. Public Works Assoc. Special Report

Doc. No.	**Contract No.**	**Date issued**
29, pgs. 75-79		Feb. 1964

Abstract

The transferring of refuse from the relatively small collection vehicle with its limited payload to a large bulk-hauler is not a new practice; such systems have been in use for a number of decades.

The ultimate goal of refuse transfer stations is to provide for the transferring of refuse at an optimum spacing to minimize non-productive travel of refuse collection vehicles. A decade ago, when collection vehicles were hauling average loads of from 3 to 5 tons and the collection crew comprised a driver and two helpers, the optimum distance between refuse transfer stations in metropolitan areas was about 6 miles. Today, refuse collection vehicles sometimes carry 5 to 7 tons and sometimes utilize only the driver during the trip to the disposal site; under such circumstances, the optimum spacing of transfer stations is from 15 to 20 miles. This extension of the radius of economic collection from about 3 miles to from 7 to 10 miles has the effect of increasing the optimal capacity of each transfer station, since a much larger service area is tributary to the station.

The Districts' experience with the one small direct-dump transfer station has led to the inescapable conclusion that such a procedure is not practical for tonnages of 400 tons daily or more and larger stations should logically be built with provisions for storage of peak loads and prompt, efficient loading of transfer vehicles.

Future Trends in Transfer--It goes without saying that non-combustible rubbish such as cans and bottles, and large awkward objects such as tree limbs, would of necessity have to be collected through the usual procedures. The grinding of only a portion of the combustible rubbish to the sewer at homes would not be justifiable since, if the collection vehicle makes a periodic stop at the home, it costs very little more to pick up all of the rubbish than it does to pick up only a portion of it.

Descriptors

refuse
transfer stations
collection
vehicles
disposal site
rubbish
grinding
combustible rubbish
sewer
transporting
solid waste
cost

Abstract (continued)

It does appear that some merit exists in grinding rubbish to the sewers at transfer stations where the solid waste unsuited for carriage in the sewer would be ahuled away for disposal elsewhere. With such a system, the sewer serves as an "endless" belt type of conveyor to deliver the ground refuse at nominal cost to sewage treament plants where it will be extracted for disposal along with sewage sludge. Many unsolved problems lie along this path, but with the use of centrifuges for economical dewatering of sludges and the composting of the sewage-refuse mixtures, such systems may prove to be an economical means of transporting certain portions of solid waste at less cost than by truck.

Disease/Solid Waste Abstracts

No. **DSW-** 649

Author

Philip E. Shayne

Title

Containerization

Reference Proceedings--Nat.Conf. on Solid Wastes Disposal
Am. Public Works Assoc. Special Report

Doc. No.	**Contract No.**	**Date issued**
29, pgs. 80-84		Feb.1964

Abstract

Basically, there are six types of detachable container systems. The first type is one in which the driver uses lifting arms. He backs up to the container and attaches lifting chains to the trunnions. He returns to the cab, hoists the container to a carrying position, then lowers the boom rest to be ready for transporting to the disposal area. This type of unit handles 3-, 6-, 10- or 15-cubic yard containers. Let's refer to this as LC (lift and carry).

A second type consists of roll out containers of 1- to 3-cubic yard capacity that are hoisted at the side of the truck and emptied into the truck body. The container is left with the customer. These compaction trucks can handle as much as 30 cubic yards of compacted solid waste. This is SL meaning Side Loader. A third type of container system is called RL (Rear Loader).

The Front-end Loading System is called FEL, and handles containers from 1- to 10-cubic yards. Arms engage the container, move it up over the cab and dump the contents into the truck body. The container is then returned to its original location. A compaction device both packs and pushes out the refuse.

A unit called the PO (Pull On) handles the largest detachable containers with capacities ranging up to 40 cubic yards. Larger containers are also available. One man operates the truck from simple controls in the cab. The container is picked up by a hydraulic device and carried to the dump for emptying. There are also Cable Systems with which maximum weights can be up to 30,000 lbs. over-the-road gross.

The latest type of equipment is the (SP stationary packer. This is really an adjunct of the container system. It consists of a huge container--up to 50 cubic yards--which is picked up by a truck, is dumped, and returned to the customer.

Descriptors

container systems
lift and carry
side loader
rear loader
front-end loading system
compaction
PO (Pull On)
Cable Systems
dump
(SP) stationary packer
equipment
cleaning
cost
chemical detergents
automation
flies

Abstract (continued)

Loose trash is fed into it and compacted into the container. Compaction reduces the volume of the solid waste by 75%. Obviously, this type of equipment is more efficient. Containers for use with stationary packers are available in sizes ranging from 15 to 50 cubic yards.

The number one problem in the container industry today is cleaning the container. Because of the manpower and time it takes, cleaning containers raises the cost of the service considerably.

Manufacturers now have chemical detergents for disinfecting and sanitizing containers and one health officer in the Surgeon General's office feels a major problem in the industry would be solved if a good grease-cutting chemical were found, and more frequent pick-ups could be arranged.

There always is a need to increase automation without increasing the complexity of operation. Some of thepresent equipment might be simplified. Future equipment can be designed with personnel limitations in mind.

We could use container lids which achieve a tighter closi g and help keep out the flies. Balanced lids make it easier to deposit trash in the container. These might be better adapted to our types of containers, so that they also keep out flies.

False cottoms to containers could be adopted by inserting a removable tray to clean out the bottom of the container and replace it with a clean tray.

Disease/Solid Waste Abstracts

No. DSW- 650

Author

Otto Kuehn

Title

Equipment Development

Reference Proceedings--Nat.Conf. on Solid Wastes Disposal Am. Public Works Assoc. Special Report

Doc. No.	**Contract No.**	**Date issued**
29, pgs.85-90		Feb.1964

Abstract

To summarize, the items to which research efforts could be applied are:

1. Study of equipment use-segregating refuse - weight - equipment cost - man power ejector plate or dump body - aluminum bodies and frames - plastic material - all related to refuse truck use.
2. Engine study - size - HP - torque and formulas to justify agreed on size of engines, etc. - twin disc clutches - double reduction rear axles - lubrication - motor oils, etc.- transistorized ignition - realistic Preventative Maintenance Program - wide tread aeroplane type tires.

The above cover the major items on which research study could be made to help the municipalities and companies dealing with refuse. We feel that the City of Chicago and other large municipalities have been instrumental in getting lower prices on equipment they purchase, due to writing specifications which allow for competitive bidding. Anything the large municipalities could do to standarize their specifications (Would it be safe to say collectively?) would certainly help to reduce the price of equipment which is purchased by competitive bidding.

Descriptors

research
equipment use
refuse
specifications
competitive bidding

Disease/Solid Waste Abstracts

No. DSW- 651

Author

C. S. Goode

Title

Utilization of Sanitary Landfill Sites

Reference Proceedings--Nat.Conf. on
Solid Wastes Disposal
Am. Public Works Assoc. Special Report

Doc. No.	**Contract No.**	**Date issued**
29, pgs. 128-135		Feb.1964

Abstract

The sanitary fill method of refuse disposal has been an accepted and systematized procedure for less than thirty years. In that time, hundreds and perhaps thousands of acres of worthless and low value land have been improved by sanitary fills for extremely useful purposes. Most of us who have been in the refuse disposal business for sometime can enumerate the swamps, marshes, used-out gravel pits, and canyons that have been converted to parks, playgrounds, parking areas, and other useful facilities.

Although most sanitary fill sites in the past few years have served a need for development as parks or recreational facilitieis, it does not follow that in the future sanitary fills will be located in areas where parks are needed. So, other uses for completed sanitary fills must be found.

We feel that continued research is needed to determine what happens to refuse in sanitary fills over a number of years under various climatic conditions. The work of Professor Merz and Ralph Stone in recent investigations has been quite helpful. This type of investigation should be continued. We also feel that definite guides are necessary for the construction of buildings over sanitary fills. It seems that such guides should be made available to Building Inspection Departments throughout the country. Additional research and wide dissemination of this type of information is certainly needed.

Descriptors

utilization
sanitary landfill
refuse
disposal
useful facilities
parks
recreational facilities
research

Disease/Solid Waste
Abstracts

No. DSW- 652

Author

Ir. W. A. G. Weststrate

Title

Composting of City Refuse

Reference Proceedings--Nat. Conf. on
Solid Wastes Disposal
Am. Public Works Assoc. Special Report

Doc. No.	**Contract No.**	**Date issued**
29, pgs. 136-147		Feb. 1964

Abstract

Composting of city refuse may serve two objectives. It may be stated that either the principal aim is to remove city refuse, or one may start from the assumption that agriculture and horticulture need organic manure and that city refuse can be utilized for the preparation thereof. Of course it is impossible to disconnect the one from the other, but it makes a difference what is considered to be the primary object: refuse disposal or the manufacture of manure.

Four methods of composting--The Van Maanen system--The city refuse is heaped in big long rows and moistened. It is fermented by means of bacteria and molds. Through the process of fermentation the substances are broken up and disintegrated and it is obvious that this is an inexpensive procedure. The bacteria are doing their work free of charge and they need not be fed, because they have enough to feed themselves on. After bacterial decomposition, which takes about six months, only an after-treatment is necessary to remove or shred the hard and non-fermented parts. The use of electricity and wear and tear on the machinery are comparatively small. However, there is one drawback attached to the Van Maanen system: it can only be carried out in remote places not in close proximity to a city, because the big heaps of refuse are not only unsightly, but produce an odor as well.

2. The Rasping System.--The city refuse is disintegrated in a big rasping machine. As is known, it is ground through a screen which is partly covered with steel pine that have the effect of a rasp. Now and then those substances which do not are drained off through a special aperture. Through the disintegration the refuse loses its disagreeable qualities, it has no odor during the process of fermentation (or it may have some odor) and it does not attract flies or rats. In addition,

Descriptors

composting
refuse
agriculture
horticulture
manure
disposal
methods
the Van Maanen system
bacteria
molds
odor
The Rasping System
The Dano System
biostabilizor
The Hammermill System
fermentation
bacteria
nitrogen
soil
hygienic
plant diseases
sewage sludge
C:N ratio
pH
temperature
sanitary landfill
use
experiments
agricultural products
horticultural
vineyards
nurseries
residue

Abstract (continued)

the fermentation of disintegrated refuse goes quicker and more evenly than that of non-disintegrated refuse. On account of these favorable factors, a rasping plant may be situated in close proximity to a town, e.g. in an industrial quarter of the town. As the disintegration is done by machine, however, this sytem is considerably more expensive than the Van Maanen system. The hard particles which should not be left in the compost are removed from before the process of fermentation takes place. The rasping system was developed in the Netherlands in 1951, and in 1952 a pilot plant was constructed at Schiedam (80,000 inhabitants).

3. The Dano System-- After 1960 the Dano factory came out with a new machine: the biostabilizor. Instead of the two drums one very big drum is used, which rotates slowly. The refuse remains in this drum for some days, if possible five days. Air is blown through, the compost is moistened and, as it were, turned over through the rotating movement. As a result of this, fermentation sets in quickly so that a fine dark-colored product is obtained after a few days. This is screened, and the coarse part, which does not pass through the screen is thrown away, or it may circulate again, but in that case the drum must be made even bigger. The fine half-decomposed refuse which passes through the screen has to be cleared of splinters etc. and has to be fermented still further. This system is attractive for refuse which is easily fermented but the yield is not high. The residue is considerable. A disadvantage is that for large quantities the drums become too big.

4. The Hammermill System--This method does not need much explaining. The hammermill spins quickly in shredding refuse, whereas the rasping machine turns slowly in serving the same purpose. The remaining steps are similar to those of the rasping system. The purification required to clear the compost from all kinds of components which should be removed presents more difficulties than the disintegration of the refuse. These impurities may be:

1. splinters of glass and pottery
2. pieces of coal and clinkers
3. iron
4. non-ferrous metals
5. pieces of rubber, leather etc.
6. nylon
7. hard plastic particles
8. plastic foil

In summary it may be stated that the main problem is: how can municipal refuse be processed to reduce the amount of unworkable residue, without detracting from the quality of the compost.

Fermentation is necessary, because bacteria would withdraw nitrogen from the soil, if disintegrated refuse were immediately applied. Moist organic matter is disintegrated by bacteria. We see this everywhere in nature. Because bacteria need nitrogen for cell production, they take it wherever they can get it. So if fresh refuse is put into the soil, the bacteria deplete the soil of the nitrogen, thereby damaging plant life which also requires this element. We may consider compost to be harless from a hygienic point of view, provided that it has been subjected to fermentation at elevated temperatures. This is particularly

Abstract (continued)

significant in the case of bacteria causing plant diseases, which may occur in municipal refuse, and also in the case of bacteria present in sewage sludge when it is mixed with refuse.

It is generally held that the fermented refuse can be used as compost when the C:N ratio is lower than 20 to 25. In actual practice, ripeness is as a rule judged on the basis of the following factors:

1. period of fermentation
2. pH
3. temperature
4. outward appearance.

If the compost is not put to use, all efforts to produce it are of no avail. The only remaining possibility then is to use the compost as cover material on a sanitary landfill.

Over the years not hundreds but thousands of experiments have been made: pot experiements: field experiments; practical experiments on sandy soil, on peat soil, on light and heavy loam soil; with agricultural products, with horticultural products, in vineyards (Germany) and in tree nurseries (Switzerland).

Local conditions play a very important part. Soil, climate, rainfall, tilling methods, etc., have a considerable influence in the results of manuring. It is, therefore, of importance that the experts concerned should conduct research on a local level.

The following will give you an impression of the extent of our knowledge of the uses of refuse compost particularly in the Netherlands:

1. In agriculture compost yields the best results on those soils which are naturally poor and drought-sensitive. These are primarily the sandy soils and peat soils. Apart from supplying organic matter, the trace elements are very important. Not all plants react the same when compost is added to the soil. Examples of compost-loving crops are sugar beets, mangolos, potatoes and turnips. In agriculture, compost is eldom used on heavy soils, since other types of manure are generally preferred.

2. In horticulture, on the other hand, preference is given to compost especially on heavy soils, but also on sandy soil and peat soil. Good results are obtained not only with all kinds of vegetables, tomatoes and cucumbers, but also with bulbs and in orchards, vineyards and tree nurseries. For citrus cultivation (in Israel), compost made from municipal refuse also has been used with great success. In particular for the Netherlands with its many hotbeds and greenhouses, the use of heating manure is important.
3. For non-agricultural purposes, such as playgrounds, parks, gardens, etc., the use of compost is preferred. Compost increases the water absorbing capacity and improves the structure of the soil, which is particularly important in the case of athletic fields.

To the best of my knowledge, it has not yet been investigated whether food manured with compost is beneficial to human health. With regard to cattle, it is known that compost counteracts disease and promotes proper growth.

Abstract (continued)

The most important points which should be investigated with regard to the preparation and the use of municipal compost are:

1. From a technical point of view: a high yield combined with a high degree of purity.
2. With respect to fermentation:
   a. investigation into the advantages and disadvantages of aerobic, semi-aerobic and anaerobic fermentation.
   b. Judging the ripesness of the compost.
3. With respect to the use of compost as manure: To build on the knowledge and experience already gained. It should be borne in mind that the question on which soils and for what purposes the use of compost yeilds good results, has to be examined for each country individually.

Disease/Solid Waste
Abstracts

No. DSW-653

Author

James J. Hanks, & Harold D. Kube

Title

Industry Action to Combat Pollution

Solid waste - used containers - disposability, degradability?

Reference

Harvard Business Review, Sept-Oct 1966

Doc. No.	Contract No.	Date issued
p. 49-62		

Abstract

Solid Wastes

It is estimated that, on the average, about 4 pounds of refuse are generated per day for each urban dweller, a figure that will rise to about 5.9 pounds per day in 1985. On a national basis, this will come to approximately 320 million tons a year.

Garbage generally represents only about 12% of the total amount of municipal refuse, but because it is highly putrescible, it creates a major air pollution problem. Combustible rubbish (newspapers, magazines, packaging materials) makes up 64% of the total refuse load, and noncombustible materials (metal and glass containers) comprise the remaining 24%. It is this latter category, however, that constitutes the major disposal problem.

According to a recent government publication, "Each year we must dispose of 48 billion cans (250 per person), 26 billion jars and bottles (135 per person), 65 billion metal and plastic caps and crowns (338 per person), plus more than half a billion dollars woth of miscellaneous packaging material". Collection and transportation of this refuse load, together with garbage and other rubbish, account for approximately 85% of all municipal costs for handling solid wastes. In terms of dollars these costs are slightly over $1.5 billion per year, which projects to at least $50 billion for the remainder of the century. In addition, it is estimated that approximately $10 billion will be spent by industry during the same period to clean up its solid wastes.

As the President's Environmental Pollution Panel pointed out:

"The accumulation of present types of non-reused containers, whether made of metal, glass, or plastic, is a substantial and difficult part of the solid waste problem. The development of containers with adequate storage life which will

Descriptors

solid waste
garbage
disposal
costs
grinders
degradability
air pollution
collection
containers
dryers
refuse
rubbish
transportation
collection depots
incinerators

Abstract (continued)

nevertheless degrade rapidly when discarded is not likely to be an easy task, but the advantages of success are great." (11)

A system might be developed which would include several collection depots within urban areas where garbage and rubbish would be put through grinders and transported hydraulically underground to out-of-town disposal sites, preferably to dryers and to incinerators. It might also be possible to transport such ground-up waste by means of some of the new sanitary collection sewers to be built throughout the country, but sewage disposal facilities would then have to be augmented to take care of this additional load. Perhaps suitable grinding equipment can be developed to reduce present kinds of metal and glass containers to manageable particles, but development of the suggested degradable container would facilitate the grinding problem.

EXHIBIT I. Principal Atmospheric Pollutants in the United States

	MT/year	Percent
By type		
Carbon monoxide	65	52%
Oxides of sulfur	23	18
Hydrocarbons	15	12
Particulate matter	12	10
Oxides of nitrogen	8	6
Other gases and vapors	2	2
Total	125	100%
By source		
Transportation	74.8	59.9%
Manufacturing	23.4	18.7
Generation of electricity	15.7	12.5
Space heating	7.8	6.3
Refuse disposal	3.3	2.6
Total	125.0	100.0%

Reference:

(11) Restoring the Quality of Our Environment, Report of the Environmental Pollution Panel, President's Science Advisory Committee (Washington, The White House, November 1965), pp. 27.

Disease/Solid Waste
Abstracts

No. DSW- 654

Author

Title

Reclamation of Municipal Refuse by
Composting

Reference Sanitary Eng. Research Project
Univ of Calif. at Berkeley, June 1953

Doc. No. Contract No. Date issued
Tech. Bulletin No. 9, Series 37

Abstract

SUMMARY AND CONCLUSIONS

As a part of an overall study of municipal refuse collection and disposal in California, the Sanitary Engineering Projects of the University of California conducted a search of literature and series of laboratory and field scale investigations of the composting of municipal refuse and other wastes. The principal findings and conclusions obtained from these studies and from an analysis of the data obtained may be summarized as follows:

1. Throughout the world there exists a great interest in composting; and within the United States there is an increasing awareness of the need for reclaiming instead of destroying organic matter.
2. Intensive farming exhausts the organic constituents of the soil unless humus is added. Humus such as might be obtained from the composting of municipal refuse benefits the soil by:
   (a) Improving soil structure
   (b) Increasing moisture holding capacity
   (c) Preventing leaching of soluble inorganic nitrogen
   (d) Making phosphorus more readily available to growing plants
   (e) Increasing buffer capacity of the soil
   (f) Adding nutrients, especially nitrogen, phosphorus, and potassium, as well as essential trace elements.
3. Reclamation of municipal refuse by composting might offer a logical solution to some of California's problems by: (a) Providing humus heeded by heavy or formerly arid soils, the large scale farming of which is fundamental to the State's prosperity; (b) Offering a new method of refuse disposal where population

Descriptors

disposal
soil
nitrogen
trace elements
sanitation
anaerobic-aerobic process
C/N ratio
grinding
market development
equipment

refuse
composting
humus
phosphorus
smog
public health
inoculation
pathogens
larvae
soil conditioner

collection
reclaiming
leaching
potassium
incineration
food
shredding
flies
cannery
fertilizer

Abstract (continued)

growth has taxed the capacity of existing landfill disposal sites; smog has caused a re-examination of the practice of incineration; or increasing standards of sanitation and public health make present practices unsatisfactory.

4. Historically, composting has been motivated by man's search for food rather than by his need for getting rid of his refuse. In America the latter problem has been of more immediate concern. This explains why composting of municipal refuse has been practiced in Europe for some time without spreading to the United States as did water and sewage treatment.

5. Successful European methods are not directly applicable to the United States because of: (a) Dissimilarity in the nature of refuse to be composed; (b) Difference in psychology of the public with respect to space, time, mechanization, and need and use of the product.

6. Traditional methods of composting involve a combination anaerobic-aerobic process which requires long periods for decomposition, often accompanied by aesthetic nuisances. Modern methods made use of the rapid, nuisance free decomposition of organic matter thermophilic, faculatively aerobic microorganisms.

7. The practice of composting throughout the world has been largely an art rather than a science. In the United Stated fundamental studies of the decomposition of organic matter had been made but their engineering applications to the composting of municipal refuse were unexplored.

8. Promotion of municipal composting in the United States has been generally directed toward the sale of patented cells, digesters, and secret processes thater than to the production and sale of compost.

9. Factors held by various proponents of composting to be essential to the process include inoculation with special organisms, seeding with manure or partially decomposed organic matter, recirculation of liquids and gases, forced aeration, and addition of enzymes and hormones.

10. The factors fundamental to composting are those fundamental to any aerobic biological process: initial population of micro-organisms; available nutrients, temperature, hydrogen ion concentration, moisture, and aeration.

11. Micro-organisms are indigenous to municipal refuse in such great numbers as to make inoculation entirely superfluous.

12. Seeding of municipal refuse with horse manure in amounts up to 30 percent of the total weight produce no beneficial effect on the rate of decomposition.

13. Recycling of partially composted material has no measurable effect on the composting process.

14. The addition of soil for the purpose of inoculating a compost of municipal refuse is of no demonstrable value.

15. Neither of two commercially produced inoculums tried improved the process in any respect.

16. Faculative and obligate bacteria, actinomycetes, and fungi are most active in the composting process. Apparently thermophilic bacteria play a major role in decomposing protein and other readily broken down organic material, actinomycetes in decomposing cellulose and lignin compounds; and fungi, being limited by temperature, play a lesser role.

Abstract (continued)

17. Shredding accomplishes mixing and aeration and facilitates bacterial invasion of refuse by breaking down natural barriers, and exposing greater surface to attack.

18. Normal city refuse contains nutrients sufficient for rapid aerobic composting.

19. The rate of decomposition is a function of the carbon-nitrogen ratio of a refuse. The higher the C/N ratio the greater the length of time required for composting.

20. In a typical compost of municipal refuse the temperature rises to 50°C within one day and to more than 60°C in two to three days. In small piles the rise is somewhat slower, often discontinuous during the transition from mesophilic to thermophilic populations.

21. A maximum temperature of 73° to 75°C is attained during the composting process - sufficient to kill pathogens, and flies in all stages of development.

22. Heat lost in the process of turning a compost is regained in two to 12 hours, depending upon the size of pile and the stage of decomposition at time of turning.

23. Hydrogen ion concentration is not limiting in the composting of combined municipal refuse.

24. In materials having a pH of 5.5 or less, which is below that of typical city refuse, calcium carbonate will raise the pH slightly during the initial stages of decomposition. Any beneficial effect on degree of decomposition which may result from adding calcium carbonate outweighed by a serious loss of valuable nitrogen.

25. The organisms involved in aerobic composting require relatively small amounts of oxygen, although more than can be supplied by simple diffusion into the pile. Turning appears to be the best practical method, as forced aeration dries the material excessively, short circuits, and involves excessive costs.

26. The fundamental steps of a rapid, aesthetically acceptable, reliable, and economical method of composting include segregation, grinding, stacking, turning, and regrinding. The course of the process and the time required are determined by moisture content, aeration and the C/N ratio. Controls include moisture adjustment and frequency of turning and require a knowledge of how to judge the condition of compost by temperature, odor, color, physical appearance, and laboratory tests.

27. Some degree of segregation is prerequisite to the grinding of municipal refuse. Tin cans, miscellaneous metals, glass and ceramics, rocks, etc. should be removed either at the household or at the disposal site.

28. The compostable fraction of municipal refuse, as observed at Berkeley is 66 percent. This is in general agreement with analyses previously made in other California Cities.

29. Grinding of refuse is necessary for rapid aerobic composting. It renders the material susceptible to bacterial invasion, makes it homogeneous and provides a beneficial initial aeration. It may be that a mixing device might be developed which would adequately break up certain types of refuse at less cost than an initial grinding.

Abstract (continued)

30. The aim of grinding is to chop refuse into small pieces. There are no special size requirements, but the material must not be pulped lest it become too soggy to compost. If a hammermill is used, a 1-1/2-inch screen opening should be about the minimum.

31. Municipal refuse is extremely abrasive, and equipment specially to grinding it has not been developed in the United States.

32. Ground refuse may be composted in windrows. The maximum height of pile to maintain good insulating properties is about 4 feet. The maximum width of pile should be about ten feen although it is not critical and may depend upon the method of turning used.

33. Composting of municipal refuse may be done in the open in dry climates. Investigations are needed to determine the best procedure under rainy conditions.

34. Ambient temperatures common in California have no apparent effect in reducing the temperatures within a compost pile. Berkeley studies showed that wind, likewise, had little effect.

35. Turning a compost accomplishes aeration, insures uniform decomposition, and exposes all pathogens and insect larvae to lethal temperatures inside the pile.

36. Turning should be done on about the third day after grinding and repeated at intervals thereafter, depending on the moisture content and structure of material.

37. If a compost becomes anaerobic, it should be turned daily until aerobic conditions are restored.

38. Equipment especially adopted to turning compost has not been developed. Such equipment should be self-propelled and designed to turn the outer shell of the pile into the interior.

39. The moisture content for good composting depends upon the nature of the material. For municipal refuse it lies between 40 and 65 percent. The moisture content of mixed Berkeley refuse after grinding averaged 49 percent.

40. Excessive moisture content may be reduced by daily turning or by the addition of straw, soil, paper, etc. Turning seems the most practical method, as additives are expensive to apply, lower the quality of the product by dilution or by raising the C/N ratio, and are less effective than turning.

41. For rapid composting without loss of nitrogen a C/N ratio of 30 - 35 is needed. A C/N ratio above 50 slows the process and lowers the quality of the finished compost. At C/N ratios below 30 nitrogen is lost. The C/N ratio of mixed Berkeley refuse averaged 33.

42. The C/N ratio of refuse may be decreased by removing paper or adding soil, or increased by adding paper or straw.

43. The course of a normal compost is characterized by (a) A rapid rise in temperature, followed by a leveling off and slow decline without appreciable fluctuations; (b) no putrefactive odors; (c) a progressively darkening color.

44. The onset of anaerobiosis may be recognized by (a) a sudden drop in temperature; (b) putrefactive odors; (c) a pale green color in the interior of the pile.

45. Anaerobic conditions can not be prevented by normal turning schedules when moisture content is excessive. Reducing the moisture content by daily turning will, however, overcome anaerobic conditions.

Abstract (continued)

46. A compost is nearing completion when its temperature begins a steady decline. Finished compost is characterized by:

(a) Dark gray or dark brown color,
(b) Neutral, slightly musty, or earthy odor,
(c) A C/N ratio of 20 or less - or more if carbon is in a difficulty available form.

47. The time required for composting varied from about 12 days, for a C/N ratio of 20, to about 21 days for a C/N ratio of 78.

48. Regrinding of finished compost makes it more uniform in texture, improves its appearance, and increases the ease of applying it to the soil.

49. Municipal refuse composts readily with either raw or digested sewage sludge, the permissible amount of sludge depending upon the moisture content of both sludge and refuse. The effect is to increase the nitrogen in the final product.

50. Composting of cannery wastes with municipal refuse seems to offer a promising solution to the problem of disposal.

51. Composting of municipal refuse in the open will not create a fly nuisance.

52. Composting of municipal refuse has not been put on a commercial basis in the United States. Until more is learned from practical operations all estimates of the economic feasibility of composting are of quite limited accuracy.

53. Any appreciable production of compost in California would presumably have to be marketed to large scale agriculturists and there is little evidence by which to estimate their reaction to the product.

54. Market development beyond specialty gardeners and nurserymen can not be expected to precede the availability of a firm supply of compost. Hence the first cities going into composting on a municipal basis may have to take certain market risks.

55. Agricultural acceptance of compost will depend upon the economy with which it can be purchased and applied to the soil. The development of special agricultural machinery for spreading compost will await its availability in quantity.

56. There would seem to be a good possibility for risk capital in the composting business, provided private enterprise can secure proper rights to public-owned refuse.

57. Composted municipal refuse will probably have to sell on its considerable merits as a soil conditioner rather than as a commercial fertilizer after being fertilized.

58. With the development of equipment especially suited to the handling of municipal refuse, and further studies of the economics involved, composting represents a very hopeful method for reclaiming municipal refuse while producing a product immensely valuable to agriculture.

Abstract (continued)

TABLE 27

CHEMICAL COMPOSITION OF MUNICIPAL REFUSE MIXED WITH UNDIGESTED SEWAGE SLUDGE

	Initial			
	Before Sludge	With Sludge	Eleven Days	Final
Ash (%)	17.97	29.10	35.64	38.02
Moisture (%)	20.76	59.20	38.78*	28.12
Carbon (%)	34.17	37.10	26.56	24.56
Nitrogen (%)	1.09	1.29	1.04	1.20
Phosphorus:				
as Phosphorus (%)	0.12	0.22	0.19	0.13
as Phosphorus-pentoxide (%)	0.55	1.01	0.87	-
Potassium:				
as Potassium (%)	0.29	0.25	0.42	0.58
as Potassium oxide (%)	0.70	0.60	1.01	-
C/N	31.3	29.0	25.0	20.3

*Moisture determined after spreading for grinding. Moisture content restored to approximately 50% after restacking for further decomposition.

TABLE 28

CHEMICAL COMPOSITION OF MUNICIPAL REFUSE MIXED WITH DIGESTED SEWAGE SLUDGE

	Initial			
	Before Sludge	With Sludge	Eleven Days	Final
Ash (%)	19.07	29.02	42.40	45.30
Moisture (%)	37.98	73.80	25.53*	35.41
Carbon (%)	39.42	42.04	31.45	27.30
Nitrogen (%)	0.77	1.38	1.10	1.21
Phosphorus:				
as Phosphorus (%)	0.17	0.25	0.25	0.23
as Phosphorus-pentoxide (%)	0.78	1.15	1.15	-
Potassium:				
as Potassium (%)	0.18	0.16	0.32	0.58
as Potassium oxide (%)	0.43	0.39	0.80	-
C/N	51.0	31.0	28.0	22.7

*Moisture determined after spreading for grinding. Moisture content restored to approximately 50% after restacking for further decomposition.

Abstract (continued)

TABLE 36

THERMAL DEATH POINTS OF SOME COMMON PATHOGENS AND PARASITES

Organism

Salmonella typhosa: No growth beyond 46°C; death within thirty minutes at 55° to 60°C. (58)

Salmonella spp.: Death within one hour at 55°C; death within 15 to 20 minutes at 60°C. (58)

Shigella spp.: Death within one hour at 55°C. (58)

Escherichia coli: Most die within one hour at 55°C, and within 15 to 20 minutes at 60°C. (58)

Endamoeba histolytica cysts: Thermal death point is 60°C. (59)

Taenia saginata: Death within five minutes at 71°C. (59)

Trichinella spiralis larvae: Infectivity reduced as a result of one hour exposure at 50°C; thermal death point is 62-72°C. (59)

Necator americanus: Death within 50 minutes at 45°C. (59)

Brucella abortus or suis: Death within three minutes at 61°C (59)

Micrococcus pyogenes var. aureus: Death within 10 minutes at 50°C.(22)

Streptococcus pyogenes: Death within 10 minutes at 54°C. (22)

Mycobacterium tuberculosis var. hominis: Death within 15 to 20 minutes at 66°C; or momentary heating at 67°C. (22)

Corynebacterium dpitheriae: Death within 45 minutes at 55°C. (22)

Disease/Solid Waste
Abstracts

No. DSW-655

Author
A. G. Davies, F.A.P.H.I., M.INST.P.C., M.R.S.H.

Title
Future Trends in Waste Storage and Disposal

Reference
Royal Soc. Health Journal

Doc. No.	Contract No.	Date issued
Vol. 82	pp 289-95	November/December 1962

Abstract

One of the least publicized industries of any country is that of the disposal of human waste, a gigantic undertaking embracing disposal by water carriage and disposal of dry waste.

Dry waste disposal might well be described as a select industry, for the total number of men engaged directly on disposal in the British Isles cannot exceed about 5,000. If the number employed is regarded as small, the amount of material handled is certainly the reverse. Provision has to be made for the disposal of about 15 million tons of domestic refuse a year, with substantial amounts of trade waste in addition. If all the material were tipped on land at a depth of six feet, there would be a land usage at a rate of 2,000 acres a year. This fact indicates the intensive nature of the future problem.

5. Future Trends

...the disposal of waste...is an industry vital to the wellbeing of nations ...that this industry for the most part lacks bold and resolute planning. There is a regrettable parochial attitude, typified for example by the attitude of indidvidual local authorities to proposals of neighbouring authorities, if boundary considerations are involved.

...Regional planning of refuse disposal is therefore urgently needed...

The composting of municipal waste, for example, has much to offer, yet there are no centrally planned operations of research. Indeed the municipal cleansing service, working as it does on a figure of expenditure in the region of

Descriptors

trends
waste storage
storage
disposal
incineration
land reclamation
composting
regional planning
research

Abstract (continued)

that mentioned at the beginning of this paper, can justify a research organization similar to that of the motor industry....

...it is quite clear that a concerted approach would be beneficial in many material respects both to councillors, officials and ratepayers.

Disease/Solid Waste
Abstracts

No. DSW- 656

Author
J. C. Wylie

Title
Fertility from Town Wastes

Reference
Faber & Faber Ltd. 24 Russell Square,

Doc. No. Contract No. Date issued
London - 1955

Abstract

Some of the principal points:

(1) The process of composting together habitation wastes is scientifically sound and has been scientifically established. Accepted scientific principles only are involved.

(2) The process should indisputably be an aerobic process. Special inoculants are not required and are quite futile compared with the complete efficiency of the natural processes of fermentation which are at our command.

(3) The composting process, when aerobically carried out, is hygienically safe and non-creative of nuisance.

(4) No large area of land is required; there might even be some saving of area by comparison with present systems of sludge lagooning - a not unimportant point in this crowded country.

(5) The engineering problems are perfectly straightforward and within the competence of any trained engineer. No patents are involved.

(6) A very important point is manpower. No more manpower will be called for than is required under present systems of disposal. There will be no dislocation of the national labour layout. Present labour available at sewage and refuse works is adequate and can quickly be trained in the easy technique required.

(7) From the point of view of the human outlook it will be an advantage that the labour employed will find themselves engaged in a creative task instead of merely on systems of destruction Their health will be good.

(8) There is a choice of methods. If complete composting is difficult, something can be done with the preparation of (a) dustbin refuse or (b) sewage sludge in improved forms separately. Salvage will, if anything, be stepped up. The collection of kitchen wastes for pig-feeding can be continued if desired.

Descriptors

composting
fermentation
patents
health
collection
sales
fertilizers
farming
safety
pathogenic
composts
viruses
aerobic process
land
manpower
sludge
pig-feeding
costs
humus
hygiene
sanitary services
parasitic
enteric
intestinal disease
inoculants
engineering
refuse
salvage
market
disposal
nitrogen
cleanliness
sterilization
organisms
bacteria

Abstract (continued)

(9) Sales prospects of the end product are excellent; it is, however, ridiculous to demand an assured market before the product is manufactured even in sample form. The best sales policy will be to manufacture a high-class granulated product and launch it under a local trade name for market gardeners and private buyers. Alternatively, a less expensive product can be offered to farmers.

(10) Costs of production should be reasonable. They should fairly be reckoned as limited to costs incurred over and above what is being spent on present methods of disposal; these additional costs, not in themselves exaggerated, should be capable of proving more than covered by sales.

(11) It is not, however, practical to suggest complete figures on a national basis for construction of plants. Local conditions will differ greatly and more experience is required. The Works at Kirkconnel, the first Works designed *ab initio* for composting purposes, are proving a financially sound venture to the Local Authority responsible.

(12) There is no doubt that such construction must rank as public works and they should carry the normal Treasury loans. Nevertheless, it is unlikely that the central authorities will take the initiative in suggesting them. The first step must come locally. The sanitary engineer will be the deus ex machina. Pilot schemes are to be recommended.

(13) The initiative will not come from the farming world. Farmers have many baffling problems to engage their attention and in any case are so well provided with easy alternatives in the shape ofother fertilizers, to which they have become accustomed, that some inertia on their part is natural. Their lassitude has handed the problem over to the engineering world.

Nevertheless, it is a point that composts are in use foolproof and do not call for any expensive service of advice dush as appears to be necessary when artificials are used.

Apart from this controversial question there is a rapidly growing consensus of opinion that *in any case* more humus is required to carry on British farming successfully and to ensure the nation's food supply.

(14) From this point of view the addition of 42,000 tons of nitrogen to our soils (not involving any sulphur requirement in manufacture) will be a most important national asset. To neglect it is criminal.

(15) The seasonal requirements of farming, as contrasted with the continuous flow of habitation wastes, may present a small future problem; it is not urgent and can be solved.

(16) The general public, for their part, cannot at present be expected to supply much pressure. They have been trained to think in terms of hygiene, cleanliness, and safety, and are accustomed to be satisfied when they see potentially disagreeable wastes disappear. They cannot be asked to enter into technical aspects. They can, however, be made aware that the methods of destruction to which they pin their faith are not nearly so satisfactory as they supposed, and that serious problems of nuisance and of water and tidal pollution are all round them.

(17) They can also be made to realize that these problems are growing problems and that the very spread of sanitary servides, which all must desire, is automatically bringing further insoluble disposal difficulties; they should finally be informed of the immense sums which it is being planned to spend on many new sewerage and other works whose sole purpose is destruction.

Abstract (continued)

(18) The health point of vies, as enunciated in the proposition that the return of all organic wastes of whatsoever kind is an inescapable rule of Nature which must be observed if plant, animal, and human health is to be maintained so that the human race may prosper, is still *sub judice*. It promises, however, to be fundamental, and, if accepted, should finally settle these questions.

Dr. Wilhelm Rudolfs recently reviewed literatire on the occurrences and survival of enteric, pathogenic and related organisms in soil, water, sewage and sludge and on vegetation. They summarized the following general points regarding the behaviour of bacteria and viruses:

(1) Raw fruits and vegetables growing in infected soil can be contaminated with pathogenic bacteria.

(2) Such infected vegetation may be difficult to clean and disinfect, especially where injured or broken parts are concerned.

(3) Among the factors influencing the survival of intestinal pathogenic bacteria in soil and on vegetation are the following:

(a) Type of organism-*Esch.coli.E.typhosa*, and *M.tuberculosis* appear to be most resistant.

(b) Temperature-lower temperature increases viability.

(c) Moisture-longevity is greater in moist soil than in dry soil.

(d) Type of soil-neutral, high-moisture-holding soils favour longevity.

(e) Organic matter-the type and amount of organic matter present may serve as a food and energy source to sustain or allow bacteria to increase.

(f) The presence of other micro-organisms has an influence on the pathogenic organisms. This has been illustrated repeatedly by longer survival after inoculation of a pathogen into a sterilized soil, sewage, or water than into a corresponding non-sterile substrate.

(4) Among the most common intestinal-disease and pathogenic bacteria, *Eberthella typhosa*, *Mycobacterium tuberculosis*, and *Escherichia coli* appear to be the most resistant to natural conditions outside the human body. Also, with the exception of *M. tuberculosis*, these have been studied the most extensively. Furthermore, the methods for isolating *Esch. coli* and *E. typhosa* in soil, sewage and water have reached higher development.

(5) As a whole, the literature leaves the impression that *Esch. coli* is more resistant than *E. typhosa* in soils, sewage and water.

Abstract (continued)

TABLE XIII

Average temperatures developed within composts during initial six weeks period of process

Heap No.	Average temperature in °F. at fixed point								Overall Average °F.
	No. 1	No. 2	No. 3	No. 4	No. 5	No. 6	No. 7	No. 8	
1	132	133	132	131	133	135	133	132	133
2	130	133	135	129	130	133	135	133	132
3	139	138	138	134	136	137	136	136	137
4	124	129	126	132	133	127	131	125	128
5	123	129	122	123	119	129	129	129	125
6	133	134	135	137	130	129	130	137	133
7	139	137	139	131	132	131	143	150	138
8	138	134	135	127	126	134	132	128	132

TABLE XIV

Analyses of temperature readings of test heaps No. 5 and No. 7 in Table XIII above

Heap No.	Reading No.	Max. Reading	No. of daily temperatures exceeding:			
			170°F.	160°F.	150°F.	140°F.
5	1	150	-	-	1	7
	2	154	-	-	4	11
	3	156	-	-	7	12
	4	148	-	-	-	6
	5	150	-	-	1	7
	6	160	-	3	8	11
	7	164	-	3	9	12
	8	166	-	3	8	11
7	1	160	-	2	8	10
	2	164	-	7	9	14
	3	168	-	4	9	15
	4	150	-	-	1	7
	5	156	-	-	5	13
	6	164	-	2	6	10
	7	168	-	7	9	18
	8	172	6	12	17	23

Disease/Solid Waste
Abstracts

No. DSW- 657

Author

Title Proceedings of the Eighth Southern Municipal and Industrial Waste Conference

Sponsored by Duke University, North Carolina State College and University of

Reference North Carolina. Held at Dept. of Sanitary Eng., School of Public Health, University of North Carolina, April 2-3,

Doc. No.	Contract No.	Date issued
1959		

Abstract

Sludge Utilization and Disposal

This paper has been developed to present the subject in three principal sections. The first of these is a resume of the general subject of sludge disposal with brief references to specific methods and projects. The second is a summary of sludge disposal practices of a number of selected towns and cities in Alabama, Arkansas, Florida, Kentucky, and South Carolina. The third is a detailed discussion of sludge disposal practices of 10 towns and cities of Tennessee.

General Considerations: Methods that have been used for final disposal of sludge from sewage treatment plants include the following:

1. Use of agricultural land.
2. Use of golf courses, parks, play grounds, and lawns.
3. Mixing with other ingredients to form a fertilizer.
4. Heat drying or incineration to ash and used as fill material.
5. Mixed with other materials in a landfill.
6. Lagooned and used as eventual fill for low lying land.
7. Hauled by ships or piped into deep water for ocean disposal.

The remainder of the Alabama plants use air drying on conventional open beds. Nearly all of the sewer plants above 0.5 mgd in capacity are being equipped with sludge shredders. Shredding seems to make the sludge easier to use, less odorous, and therefore easier to market or give away.

The State Health Department advises against the use of air-dried sewage sludge on edible crops and suggests that its application be limited to beef cattle pastures, lawns, shrubbery, and flower pots, or inedible row crops.

Descriptors

sludge
agricultural land
ash
ocean disposal
utilization
heat drying
fill material
disposal
incineration
lagooned

Disease/Solid Waste
Abstracts

No. DSW- 658

Author
Everett Schiller & Robert Rausch

Title A Vole (Microtus) an Important
Natural Intermediate Host of Echinococcus
granulosus.

Reference
Arctic Health Research Center, U.S. Public

Doc. No. Contract No. Date issued
Health Service, Anchorage, Alaska, 1950

Abstract

Autopsies...revealed the presence of *Echinococcus granulosus* in 5 of 7 artic foxes (Alopex lagopus). ...Examinations of 26 dogs were negative for this cestode.

...Helminthological studies...disclosed infections of larval *E. granulosus* in the tundra vole, *Microtus oeconomus inuitus Merriam*. Of 587 voles examined, 14 were infected.

The St. Lawrence Island people eat a considerable quantity of native green plants (identity as yet undetermined) during the summer months. These are commonly consumed raw and unwashed as they come from the field. In view of the abundance of arctic foxes, it is likely that there is much contamination of this type of vegetation. It is probable that the arctic fox-vole-green plant-human relationships play an important part in maintaining the natural and accidental infections with *E.* granulosus on the Island.

Descriptors

A Vole
cestode
Microttus oeconomus inuitus Merriam
contamination
Echinococcus granulosus
tundra vole
arctic foxes
plants
vegetation
infections

Disease/Solid Waste
Abstracts

No. DSW- 659

Author

Joseph E. Alicata & Robert W. Brown

Title Observations on the Method of Human Infection with Angiostrongylus Cantonensis in Tahiti

Reference

Canadian Jour. Zoology, V 40, 1962

Doc. No.	Contract No.	Date issued
pp. 755-760		

Abstract

ABSTRACT

Infective larvae of the rat lungworm *Angiostrongylus cantonensis*, the causative agent of parasitic meningoensephalitis in man, have been found in about 4% of the stomach contents of fresh water prawns examined in Tahiti. This is believed to constitute the main source of the local human infection. These crustaceans and "taioro," a food consisting of grated coconut and prawn juice, are commonly eaten raw by Tahitians and some local Europeans. Infected mollusks have also been found on vegetation commonly eaten raw, and may constitute an occasional source of human infection. Laboratory-raised rats have been experimentally infected with *A. cantonensis* by applying infective larvae on the abraded skin. No infection occurred when the larvae were placed on the intact skin. In addition to land mollusks, the freshwater snail (*Fossaria ollula*) was also found to be a suitable intermediate host for *A. cantonensis*.

Descriptors

Angiostrongylus Cantonensis
snail
parasite
vegetation
water supply
prawns
rat lungworm
mollusks
intermediate hosts
rats
eosinophilic meningoencephalitis
planarians
carrier host

Disease/Solid Waste
Abstracts

No. DSW-660

Author M. Josephine Mackerras and
Dorothea F. Sandars

Title
The Life History of the Rat Lung-Worm,
Angiostrongylus Cantonensis (Chen)
(Nematoda: Metastrongylidae)

Reference
Australian Journal of Zoology

Doc. No.	Contract No.	Date issued
Vol. 3, p. 1-25		1955

Abstract

Summary

Adult Angiostrongylus cantonensis live in the pulmonary arteries. Unsegmented ova are discharged into the blood stream, and lodge as emboli in the smaller vessels. First-stage larvae break through into the respiratory tract, migrate up the trachea, and eventually pass out of the body in the faeces.

Slugs (Agriolimax laevis) act as intermediate hosts. Two moults occur in the slug, and third-stage larvae appear about the 17th day. The larvae remain within the two cast skins until freed in the stomach of the rat by digestion. They then pass quickly along the small intestine as far as the lower ileum, where they leave the gut and become blood-borne.

They congregate in the central nervous system, and have been found there 17 hr. after ingestion. The anterior portion of the cerebrum is the most favoured site, and here the third moult takes place on the sixth or seventh day and the final one between the 11th and 13th days. Young adults emerge on the surface of the brain from the 12th to 14th day, and spend the next 2 weeks in the subarachnoid space. From the 28th to 31st days they migrate to the lungs via the venous system, passing through the right side of the heart to their definitive site in the pulmonary arteries. The prepatent period in the rat usually lies between 42 and 45 days.

Descriptors

Angiostrongylus cantonensis
faeces
slugs
intermediate hosts
lung-worms
rats

Disease/Solid Waste
Abstracts

No. DSW- 661

Author

H. Williams Smith

Title

The Effect of Feeding Pigs on Food Naturally Contaminated With Salmonellae

Reference

Journal of Hygiene

Doc. No.	Contract No.	Date issued
Cambridge Vol. [illegible]	p381-389	1960

Abstract

The finding that organic supplements of animal food such as bone meal, meat meal, meat and bone meal and fish meal of non-European origin are frequently contaminated with salmonellae...has awakened interest in the possibility that they may be an important source of salmonella infection in animals and, indirectly, in man. Most of this interest has centred around pigs because they are commonly fed on diets containing such supplements, and because pig meat is the meat most commonly incriminated in outbreaks of food poisoning in man.

Under normal farm conditions it is unlikely that many pigs would receive food-stuffs so heavily infected with salmonellae as those used in the presemt experiment. The degree of contamination of the bone meal used was higher than usual....

No harmful effect from feeding this infected diet was noted in the experimental pigs.... ...in a separate observation, two 4-month-old calves were fed 1 oz. daily for a month of the bone meal containing Salm. dublin and Salm. typhi-murium, the two principal salmonella pathogens of calves, mixed in the food. The calves remained healthy and neither serotype was found in their faeces; nor were they isolated from any internal organ including the mesenteric lymph nodes at slaughter; no antibody to either serotype was demonstrated in their serum.

The present experiments indicate that little or no clinical disease appears in pigs fed on these salmonella-contaminated foodstuffs and this finding is supported by the results obtained from a survey (Smith, 1959) where a 12% isolation rate was achieved from healthy pigs at slaughter.... ...the fact that salmonella organisms including Salm. dublin and Salm. typhi-murium may be introduced on to farm premises and might become established in pigs or other stock is a serious implication. Nevertheless, it would appear that the main danger of feeding

Descriptors

animal food
meat meal
salmonellae
pigs
man
salmonella pathogens
slaughter
faeces
bone meal
fish meal
infection
food poisoning
calves
disease
excreters

Abstract (continued)

salmonella contaminated foods to pigs lies in the risk of meat becoming contaminated by alimentary contents at slaughter and resulting in infection in man. There was no evidence to indicate that the meat of any of the edible organs became infected with salmonellae during life and there should be little risk from infected mesenteric lymph nodes because they are normally discarded at slaughter.

...none of the experimental pigs became permanent faecal excreters of salmonellae and after discontinuing the use of the contaminated food, no salmonellae were found in their faeces.

Disease/Solid Waste
Abstracts

No. DSW-662

Author
Thelma De Capito

Title
Isolation of Salmonella From Flies

Reference
American Journal of Tropical Medicine

Doc. No.	Contract No.	Date issued
Vol. 12, p. 892		November 1963

Abstract

Isolations of Salmonella, other than S. typhi, from domestic flies have been reported infrequently. Floyd and Cook reported 2 isolations of S. typhimurium and 4 of S. typhi from 165 fly pools containing 3,900 flies.[1]

Richards, Jackson, De Capito, and Maier reported isolations of Shigella from domestic flies and humans.[2] The purpose of this note is to record 13 isolations of Salmonella obtained during that study from 3,263 pools of 65,273 flies. Isolations were made from primary SS plating media and no enrichment or other specific media for Salmonella were used.

Nine serological types of Salmonella were identified. S. typhimurium was isolated from 2 pools, S. anatum from 2 pools, and S. simsbury, S. typhi, S. panama, S. meliagridis, S. infantis, S. kentucky, and S. luciana once each from other pools.

References

1. Floyd, T. M. and Cook, B. H., 1963. The housefly as a carrier of pathogenic human enteric bacteria in Cairo. J. Egypt, Pub. Health Assoc. 28:75

2. Richards, C. S., Jackson, W. B., De Capito, T. M., and Maier, P. P., 1961. Studies on rates of recovery of Shigella from domestic flies and from humans in southwestern United States. Am. J. Trop. Med. & Hyg., 10:44-48

Descriptors

Salmonella
domestic
Shigella
flies

Disease/Solid Waste
Abstracts

No. DSW- 663

Author
F. E. Chase and M. L. Wright

Title
Salmonella in Dried Eggs

Reference
Canadian Journal of Research

Doc. No.	Contract No.	Date issued
Vol. 24F	P. 77-80	January 1946

Abstract

Salmonella organisms have been reported in dried eggs. Though no serious health hazards have been attributed to this source, dangerous species have been found in duck, pigeon, and turkey eggs. In the work reported heree 2,400 hens' eggs were examined for the presence of Salmonella types; 1,000 from a flock of 55 known Salmonella pullorum reactors were examined as to contents, and 400 from the same flock for Salmonella types on the shell, as well as 1,000 eggs from normal birds. Slective media were used and organisms were classified as Salmonella when they satisfied the criteria of Gibbons and Moore.

The contents of the 1,000 eggs from the pullorum reacting flock showed 61 of them infected with Salmonella pullorum. No Salmonella organisms were obtained from the 400 diseased shells, nor from the contents of the 1,000 eggs from normal birds. While the data indicate that hens' eggs are unlikely to be infected with Salmonella organisms other than S. Pullorum, further studies should be made towards the manner in which other Salmonella species affect laying hens.

Descriptors

Salmonella
eggs
health hazards
hens' eggs
Salmonella pullorum

Disease/Solid Waste
Abstracts

No. DSW-664

Author
Anon.

Title
Epidemic Cholera

Reference
British Medical Journal

Doc. No.	Contract No.	Date issued
Vol 5466	-	1965

Abstract

Cholera is an ancient and dramatic scourge of mankind... It disappeard from American at the end of the last century, and 1923 marked the end of the last great pendemic wave.

From then on cholera declined and remained restricted to its endemic area in the basin of the Ganges and Brahmaputra deltas in West Bengal and East Pakistan. From an average of 164,000 deaths a year in the period 1945-9 the toll dropped to 11,000 deaths in 1960 and the disease seemed to be disappearing spontaneously. This did not prove to be the case, and in 1963, there were 65,157 cases with 21,735 deaths, the highest figures for five years.

Vibrio eltor was first isolated in 1906 and for several decades has largely been confined to an endemic area in the Celebes Islands. The infection it causes is clinically indistinguishable from typical cholera...

Since 1961 cholera El Tor has spread from the Celebes and invaded Indonesia, Sarawak, the Phillipines, Sabah, Taiwan, Korea, Hong Kong and probably the Chinese mainland, Irian Barat (West New Guinea), Malaysia, Burma, Thailand, India, and Pakistan. In 1965 an epidemic broke out in Afghanistan, the eastern provinces of Iran, Bahrein, and entered Uzbekistan in the U.S.S.R. The entry of cholera El Tor into India was first detected in April 1964 in Calcutta...

...Healthy carriers may excrete V. eltor for several months in contrast to up to three weeks for V. cholerae, so it is reasonable to suggest that the El Tor variety may spread further in the Middle East and possibly to the West.

Recently a controlled field trial of the effectiveness of classical and El Tor cholera vaccines has been carried out in the Phillipines.[3]...The trial covered 584,000 people and tested an endemic V. eltor fluid vaccine, a V. cholerae vaccine,

Descriptors

cholera
endemic
Vibrio eltor
El Tor
spread
infection
classical cholera
carriers
vaccines
deaths
travel
environmental
hygiene

Abstract (continued)

a cholera oil-adjuvant vaccine, and a monovalent typhoid vaccine.

There were 325 confirmed cases of cholera in the vaccinated groups, with 25 deaths....

An analysis of the symptoms of the 325 cases showed that the course of cholera El Tor diseases was not significantly altered by vaccination....

...Modern travel enables cholera to be imported anywhere, but it can spread only when environmental hygiene is poor....

Reference:

3. Phillipines Cholera Committee, Bull. Wld Hlth Org. 1965, 32, 603

Disease/Solid Waste
Abstracts

No. DSW-665

Author
R. D. P. Eaton, M.B., D.P.H.

Title
An Outbreak of Infectious Hepatitis

Reference
Canadian Journal Public Health

Doc. No.	Contract No.	Date issued
Vol. 52, p. 297-303		1961

Abstract

...There was no proof of any mode of spread other than by direct contact. Water, milk and food supplies were not incriminated. At one time it was thought that an insanitary water line at the public school in Keewatin might be an underlying cause but it was then found that the incidence in the separate school was even higher and in this school chlorinated water from a satisfactory source was used exclusively. Apart from this, many children were already infected before the start of the school year.

The data obtained in this study demonstrate convincingly the facilitation of transmission of infectious hepatitis by an insanitary environment. In an area where the conveniences made possible by a municipal sewer and water supply were available in all homes, the incidence rate was only slightly more than one-quarter the rate obtaining in areas where piped water and waterborne sanitation were the exception (1.1% compared with 4.1%).

Descriptors

infectious hepatitis
water
milk
food supplies
children
insanitary environment
sewer
water supply
sanitation
piped water
families
personal hygiene
gamma globulin prophylaxis
hand-washing

Disease/Solid Waste
Abstracts

No. DSW-666

Author
John R. Paul and Horact T. Gardner

Title
Endemiologic Aspects of Hepatitis in U. S.

Troops in Germany 1946-1950

Reference
American Journal of Medicine

Doc. No.	Contract No.	Date issued
Vol. 8 P. 565		1950

Abstract

Infectious Hepatitis. Most epidemiologic evidence indiates that infectious hepatitis is spread through some form of person-to-person contact, although explosive waterborne and food-borne epidemics have been described....

Evidence has been presented to indicate that infectious hepatitis has been prevalent and endemic in Germany for many years and, therefore, it is not surprising that this disease should have been common among U.S. troops in the Army of Occupation quartered there during the postwar years.... With the entry and maintenance of U. S. troops in this region, we have an example of a continuous supply of susceptible immigrants constantly mingling with an "infected population." It is our suspicion that many if not the majority of U.S. soldiers who acquire hepatitis in Germany do so as a result of direct personal contact with German people or in German households.

Descriptors

Endemiologic Aspects
Hepatitis
transmission
theories
contact
waterborne
food-borne
epidemics
troops
infected population.

Disease/Solid Waste
Abstracts

No. DSW-667

Author Jerome T. Syverton, Robert G. Fischer, Sidney A. Smith, Richard P.Dow, Herbert Schoof

Title
The Cockroach as a Natural Extrahuman Source of Poliomyelitis Virus.

Reference
Fed. Proc.

Doc. No.	Contract No.	Date issued
Vol. 11 P. 483		1952

Abstract

Studies in this laboratory have made known the ability of the cockroach Periplaneta americana, under laboratory conditons to acquire, maintain and excrete 1) mouse encephalomyelitic virus, GDVII strain; 2) Coxsackie virus, Group A, type 4; 3) human poliomyelitis virus, Brunhilde type, Minnesota and Mahoney strains.... The identity of each virus after recovery from recipient animals was established.... It is timely to report the isolation of 4 strains of poliomyelitis virus from 4 lots of cockroaches captured on the premisis of paralytic polimyelitis patients from 2 states.... These lots of cockroaches were made up of 3 species commonly associated with man: Periplaneta americana, the large winged American cockroach; Supella supellectilium, the tropical roach; Blattella germanica, the common small German Roach or "croton bug". The premises from which the roaches were obtained are representative of good and poor sanitary environments.... ...the relation of the cockroach to the natural transmission and dissemination of poliomyelitis remains to be determined....

Descriptors

cockroach
Coxsackie virus
human poliomyelitis virus
laboratory findings
field studies
roaches
sanitary environments
transmission

Disease/Solid Waste
Abstracts

No. DSW-668

Author Ralph S, Paffenbarger, Jr.
James Watt

Title
Poliomyelitis in Hidalgo County, Texas, 1948
Epidemiologic Observations

Reference
American Journal of Hygiene

Doc. No.	Contract No.	Date issued
Vol. 58 No. 3	Pg. 269-287	November 1953

Abstract

Summary

Two major points are shown in the data presented:

Fly control instituted before, and continued during, an outbreak failed to reduce poliomyelitis cases or to affect the time-course of the epidemic in cities with community-wide fly control.

A significant number of paralytic cases gave a history of contact with a preceding paralytic case under circumstances suggesting this as the mechanism of transfer.

It is inferred from the data about contact, analyzed by ethnic group and socioeconomic conditions, that personal contact between paralytic cases and susceptible hosts, directly or through an intermediary, played the definitive role in the development and spread of this epidemic.

Descriptors

Disease/Solid Waste
Abstracts

No. DSW-669

Author
E. S. Tisdale and C. H. Atkins

Title
The Sanitary Privy and Its Relation to
Public Health

Reference
American Journal of Public Health

Doc. No.	Contract No.	Date issued
Vol. 33 P. 1319		1943

Abstract

In the early part of the 20th century it was discovered that the prevention or control of typhoid fever, diarrhea, dysentery, hookworm, and other enteric diseases was dependent upon the sanitary disposal of human excreta. The facilities developed to break the chain of transmission of these diseases between the patient or carrier and the susceptible host were sewerage systems, septic tanks, and sanitary privies.....

...The 1940 census revealed that there are 14,778,360 rural homes in the United States. Of these, 9,631,762 are served by outside toilets and 907,923 have no toilet facilities. The 3,000,000 privies constructed under the work-relief programs, and 50 per cent of the remainder of the privies serving rural homes, or a total of about 6,300,000, now are assumed to be reasonably satisfactory. On this basis it is conservatively estimated that more than 4,000,000 additional sanitary privies are needed in this country....

The sanitary privy has a definite relationship to public health and in this connection the following points are significant:

1. In areas where water carriage severage systems are impracticalble the privy is the facility relied upon to break the transmission chain of intestinal diseases.

3. The 3,000,000 sanitary privies constructed under the various work-relief programs have had an important effect in reducing the incidence of intestinal diseases.

6. Approximately 4,000,000 additional sanitary privies are needed to serve about 16,000,000 persons now without sanitary excreta disposal facilities, who for the most part reside in areas having the highest incidence of typhoid fever, dysentery, and hookworm.

Descriptors

enteric diseases
excreta
transmission
diseases
severage systems
septic tanks
dysentery
sanitary privies
1940 census
rurual homes
public health
intestinal diseases.
incidence
typhoid fever
hookworm

Disease/Solid Waste
Abstracts

No. DSW-670

Author
Henry A. Schroeder

Title
Relation Between Mortality From Cardiovascular Disease and Treated Water Supplies

Reference
Journal of American Medical Association

Doc. No.	Contract No.	Date issued
98/1902		23 April 1960

Abstract

In the United States variations from state to state in death rates from cardiovascular diseases have been unexplained on dietary, racial, or social basis. One variable environmental influence to which all persons are exposed is potable water. Statistical analyses of water hardness and death rates from all causes, cardiovascular diseases, coronary heart disease, and noncardiovascular diseases, showed highly significant correlations for all but noncardiovascular causes. Similar relationships were demonstrated for caucasoid men, aged 45 to 64 years, by state and, in the case of coronary disease, inthe 163 largest cities. Of 21 constituents of finished municipal water in each city, highly significant correlations were found for magnesium, calcium, bicarbonate, sulfate, fluoride, dissolved solids, specific conductance, and pH. In all cases correlations were negative, i.e., softer water was associated with higher death rates. Some factor either present in hard water or missing or entering in soft water appears to affect death rates from degenerative cardiovascular disease.

Descriptors

death rates
cardiovascular disease
water
water hardness
magnesium
calcium
bicarbonate
sulfate
fluoride
dissolved solids
specific conductance
pH
correlations
softer water
degenerative cardiovascular disease

Disease/Solid Waste
Abstracts

No. DSW-671

Author
R. D. Sharp

Title
Rodent Control at Refuse Dump

Reference
Soap and Chem. Spec.

Doc. No.	Contract No.	Date issued
Vol. 41 P. 110-114		September 1965

Abstract

The operation of a municipal dump presents particularly hard to cope with rodent control problems, since an abundance of food and natural burrows offer rats an almost ideal habitat....

To control the large rats infesting the dump, a professional pest control operator was retained for four years at a cost of $80.00 per month. Using two assistants, the pest control operator baited the dump once a month. It soon became evident that stronger measures would have to be instituted, for the rat population was increasing, spreading out, invading and destroying private property. The culmination of this situation came when the village of Canastota was sued by a dairy farmer.

Although the dairyman's barns and shed were located about 600 feet from the canal separating his property from the municipal dump, rats from the dump were destroying feed stored in these buildings....

...The town garage where empty refuse trucks were stored also had problems with rats which seemed to be attracted by the odor of garbage clinging to the trucks....

At the town park, the refreshment stand, other small buildings and picnic areas are also prime locations...

Descriptors
municipal dump
rats
habitat
dump
pest control
rat population
town garage
refuse trucks
garbage
park
refreshment stand
picnic areas

Disease/Solid Waste
Abstracts

No. DSW-672

Author

Joseph E. Alicata

Title

Pigs and Calves as Carrier Hosts for the Infective Larvae or Angiostrongylus Cantonensis

Reference

Journal of Parasitol.

Doc. No.	Contract No.	Date issued
v. 50 (3, Sect. 2), 39		1964

Abstract

Preliminary experiments have been conducted to determine whether pigs and calves can serve as paratenic hosts for Angiostrongylus cantonensis. In one experiment, two young pigs were administered in liquid by dose syringe approximately 5,000 larvae each and a young calf, 50,000 larvae. The animals were killed 2 weeks later, and various organs including stomach, spleen, liver, lungs, heart, kidneys, brain, and skeletal muscles examined by peptic digestion and baermannization methods. Live and unchanged larvae of A. cantonensis were recovered only from the stomach, spleen, liver, and lungs; larvae fed to rats were recovered from the brain tissue 6 days later. In a second experiment, two pigs were each fed 10,000 larvae and killed 5 weeks later. Examination of the above-mentioned organs revealed no live larvae. Many elevated cysts, about 1 mm in diameter, containing dead larvae, were present on the surface of the stomach, spleen, and liver. Control noninfected pigs and rats were negative. To what extent pigs and calves serve as sources of human infection remains to be determined. Raw liver is said to be eaten in some areas of the Pacific. The comparatively early death of the larvae in swine, however, appears to minimize their importance as carrier hosts. (Supported in part by USPHS Research Grant NB-04965-01, from the National Institute of Neurological Diseases and Blindness.)

Descriptors

pigs
calves
carrier
hosts
Angiostrongylus cantonensis
larvae
human infection

Disease/Solid Waste
Abstracts

No. DSW-673

Author

Title
What the Engineer Should Know About

Tropical Disease

Reference
Public Works

Doc. No.	Contract No.	Date issued
Vol. 75, p. 14-5 & 44-46		April 1944

Abstract

...There has been much discussion of the danger that our returning soldiers may bring back to this country some of the tropical diseases from overseas, and that these diseases will present our health authorities with really serious problems. Little has been written for engineers on this subject to tell them what part they will have in post-war disease control, if such a problem does arise.

The diseases most generally discussed at this time may be grouped by their method of transmission as follows: (a)- those that are spread by certain varieties of mosquitoes - malaria, yellow fever, and filariasis or elephantiasis;(b)- those spread through food or water - amebic dysentery and cholera;(c)- typhus fever, of which there are two forms, one spread by lice and one by rat fleas; (d)- plague, also spread by rat fleas, and(e)- schistosomiasis, which is contracted by swimming or wading in water in which snails of a certain type live. These various groups of diseases will be considered from the viewpoint of the engineer.

...Since there are anopheles mosquitoes, theoretically able to transmit malaria, in nearly all sections of the United States, there is a possibility that a focus of malaria may develop in any place where a returning soldier with malaria parasites in his blood decides to locate.

...While the Aedes aegypti mosquito, which is the carrier of yellow fever, is one of the most common pests, the significant development and spread of yellow fever in the United States as a result of the war is highly unlikely. First, all soldiers going overseas are inoculated against this disease; second, our health officials know the exact methods of controlling the disease; and, third, the Aedes aegypti mosquitoes in a community can be quite easily eradicated if this is necessary.

...In the past, there have been numbers of persons entering this country from filariasis infected areas without creating epidemics.

Descriptors

soldiers
tropical
diseases
engineers
post-war disease control
mosquitoes
malaria
yellow fever
filariasis
food
water
amebic dysentery
cholera
typhus fever
lice
rat fleas
plague
fleas
schistosomiases

Abstract (continued)

Water-Borne Diseases.

Cholera has not been a problem in this country and with our present methods of water treatment it is unlikely that it will be. It is notorious for its ability to spread and has existed in this country in the past, but medical authorities consider its importation, as a result of the present war, unlikely; and its spread, even if introduced, extremely unlikely.

...Though around 8% of the population of various sections of this country appear to harbor the cysts of Entameba histolytica, which cause the disease, amebic dysentery has never been an important health problem here. It seems unlikely that the addition of a few more carriers, relatively speaking, will materially change the situation.

Schistosomiasis,... By some it is thought possible that persons infected overseas will discharge in their urine or feces fluke eggs which may infect American snails of the same family. It is generally though unlikely that this will occur because it is believed that the capacity of the snails to serve as vectors is restricted to specific species not found in this country.....

Rat-borne typhus is, and has been, quite common in our Southern States.... Rat control should be seriously considered as a postwar project by many communities....

Louse-borne typhus is a more deadly disease. It is this type that we read of in newspapers as being responsible for so many deaths in the war areas. For centuries typhus has followed armies. It is particularly a cold-weather disease because that is when conditions are most favorable for lousiness. Control depends on cleanliness. The provision of disinfectation facilities to delouse clothing, and of baths is essential....

Disease/Solid Waste
Abstracts

No. DSW- 674

Author
Joseph L. Melnick and Lawrence R. Penner

Title
The Survival of Poliomyelitis and Coxsackie Viruses Following Their Ingestion by Flies

Reference
Journal Exp. Medicine

Doc. No.	Contract No.	Date issued
Vol. 96 p. 255-271		1952

Abstract

Within the past decade, it has become established that during typical summer epidemics of poliomyelitis the causative virus can be isolated readily from several different species of flies (1-4). This has been true of urban as well as rural epidemics. However, it is not possible to assess as yet the full significance of fly contamination as far as the spread of human disease is concerned, a major question being whether flies act as true hosts of the virus. Earlier work in this laboratory on the ingestion of virus by the blowfly, Phormia regina, has shown that human poliomyelitis virus, as naturally present in the stools of patients, may be excreted for 2 to 3 weeks after its feeding (5). A the early experiments were qualitative in design, no measure was made of the exact amounts of virus taken up by the flies or of the amounts excreted shortly after the feeding and in the 2nd and 3rd week thereafter.

The present experiments were designed to be quantitiative in nature and are cancerned with the survival of virus in the fly and its possible multiplication in this insect. In view of the recent discoveries of the simultaneous infection of patients with poliomyelitis virs and Coxsackie, or C, viruses (6) and of the simultaneous occurrence of these agents in flies trapped furing poliomyelitis epidemics (4, 7), experiments were also carried out in which C virus alone or in association with poliomyelitis virus was fed to flies.

Summary

Poliomyelitis virus and Coxsackie (or C) virus were quantitatively fed to blowflies, Phormia regina and Phaenicia sericata, and to houseflies, Musca domestica. Naturally infectious human stools were the source of virus.

Descriptors

poliomyelitis
virus
flies
fly contamination
human disease
survival of virus
Coxsackie, or C, viruses
blowflies
Phormia regina
Phaenicia sericata
houseflies
Musca domestica
stools
insects
excreta
maggots

Abstract (continued)

Poliomyelitis virus can be almost quantitatively recovered from flies and from their excreta collected over a period of several days following the feeding. C virus can also be recovered but in lesser yields. No conclusive evidence for virus multiplication in these laboratory-bred insects was obtained.

Poliomyelitis virus from human sources could be detected in flies between the 5th and 17th day and in the excreta between the 4th and 10th day. Murine-adapted strains of poliomyelitis virus andmurine encephalomyelitis virus could not be detected beyond the 5th day, even though comparable amounts of virus were fed. The persistence of C virus excretion (2 to 12 days) varied directly with the amount of virus fed.

Poliomyelitis virus, as present in human stools, survived drying and storage at room temperature for at least 3 days and at 4° for 3 weeks. C virus from human stools under the same circumstances was detected for 15 days at room temperature (with marked drop in titer after the 3rd day) and for 21 days at 4° with little loss in titer. When stool samples were fed to flies and the dried excreta of the insects examined, it was found that (a) poliomyelitis virus persisted for at least 1 to 2 days at room temperature and for 3 to 4 days at 4° and (b) C virus persisted for 1 day at room temperature and for 5 days at 4°.

Poliomyelitis virus could be carried through only two serial passages in adult flies. Flies emerging from maggots fed virus were free from the agent.

Disease/Solid Waste
Abstracts

No. DSW- 675

Author M. L. Furcolow, F. E. Tosh, H.W. Larsh
H. J. Lynch, Jr., and G. Shaw

Title
The Emerging Pattern of Urban Histoplasmosis

Studies on an Epidemic in Mexico, Missouri

Reference
New England Journal of Medicine

Doc. No.	Contract No.	Date issued
Vol. 264	p. 1226-1230	1961

Abstract

. . .In these papers two sources of infection among urban children were reported: visits to farms or prior rural residence and exposure in urban structures contaminated with bird droppings. Kier et al.[3] have reported a third source - importation of contaminated farm soil or manure as fertilizer. In the present paper we wish to call attention to a fourth source of infection among urban children - namely, infection in wooded, open park areas contaminated by bird droppings. This mode of infection is illustrated by the report of an epidemic.

. . .During the second week in April, 1959, similar illnesses characterized by chills, high fever and cough developed in 4 boys in Mexico. All 4 had x-ray films of the chest taken at the local hospital, and 2 were admitted there. The clinical features and x-ray findings in these 4 cases led the hospital radiologist to suspect histoplasmosis. Positive skin and serologic tests later confirmed the diagnosis.

. . .they were all boy scouts and members of the same troop... Furthermore, their only close association was related to scouting activities. All 4 had onsets of illness within twelve to fourteen days after March 28, 1959. On that day a group of 64 scouts from the 4 Mexico troops had worked together clearing a large city park. The main activity had been raking leaves and debris into piles, which were then burned.

Exposure to Imported Farm Soils or Manures

The first report of H. capsulatum infection due to the importation and use of infected soil was presented by Kier et al.[3] in 1954 from Memphis, Tennessee. Similar epidemics were reported from Rockford, Illinois, in 1955[5], Mountain Home, Arkansas, in 1956[6], Dallas County, Alabama, in 1958[7], and Sturgis, Mississippi, in

Descriptors

Histoplasmosis
Histoplasma capsulatum
children
farms
rural residence
bird droppings
farm soil
manure
fertilizer
infection
urban children
park areas
soil
chickens
demolition
pigeons
blackbirds
starlings
excreta
fungus

Abstract (continued)

1959[8]. In these urban epidemics it appeard quite clear that the importation of infected material contaminated by droppings of birds, usually chickens, was the cause.

Exposure in Urban Structures

Still another group of epidemics have been associated with the demolition of buildings in cities, particularly belfries, old schoolhouses and various other old buildings, all of which were contaminated with bird droppings, usually from pigeons. ...

. . .The present paper points up the importance of contamination of soil in urban locations by a new type of bird - namely, the European starling (Sturnus vulgaris linnaeus). . . .

Summary and Conclusions

Further evidence has now accumulated that city dwellers contract histoplasmosis by contact with point sources of growth of the organism and not by the casual inhalation of wind-borne spores disseminated throughout the city.

A pattern of urban histoplasmosis that includes at least four distinct sources of infection has emerged: visits to farms or prior rural residence; exposure to imported farm soils or manures; exposure in urban structures frequented by birds; and exposure in open urban areas. In each of these forms of exposure, urban infection can be related directly to exposure to sources contaminated with bird excreta.

An urban epidemic of histoplasmosis in Mexico, Missouri, illustrating the fourth source of infection listed above, is described. Frequent isolations from this source indicate a high degree of contamination with Histoplasma capsulatum.

It is postulated that starlings and perhaps other gregarious birds that frequent cities may be important in creating sites of florid fungus growth within communities in areas of both high and low prevalence.

Reference

3. Kier, J.H., Campbell, C.C., Ajello, L., and Sutliff, W.D. Acute bronchopneumonic histoplasmosis following exposure to infected garden soil. J.A.M.A. 155:1230-1232, 1954
5. Loosli, C.G., Symposium on clinical advances in medicine; histoplasmosis; some clinical epidemiological and laboratory aspects. M. Clin. North America 39:171-199, 1955
6. Chi. T. D. Y., et al. Epidemic of histoplasmosis among school children in Arkansas. South, M.J. 49:785-792, 1956
7. Hosty, T.S., Ajello, L., Wallace, G.D., Howell, J. and Moore, J. Small outbreak of histoplasmosis. Am. Rev. Tuberc. 78:576-582, 1958
8. Hagstrom, R.M. Epidemiologic studies by county health departments. Mississippi Doctor 37:141-145, 1959

Disease/Solid Waste
Abstracts

No. DSW- 676

Author		
Robert Cruickshank		
Title		
The Problem		
Reference		
Milbank Memorial Fund Quarterly		Supplements
Doc. No.	Contract No.	Date issued
Vol. 43	p. 215-7, 240-57	April 1965

Abstract

Since the beginning of the twentieth century, deaths from acute diarrheal diseases have shown dramatic declines in most economically advanced countries. For example, in New York and London, mortality rates have fallen from approximately 5,600 and 4,000 per 100,000 infants (0-1 year) in 1900 to 45 and 35, respectively, in 1961. For children aged 1-4 years the corresponding rates have fallen from approximately 400 and 200, respectively, to around 2.5 per 100,000 population. But this encouraging trend affects only about one-eighth of the total child population of the world. In many of the developing countries in Latin America, Asia, and Africa, deaths from the acute dirrheal diseases top the mortality lists among children under five years of age. Again, great differences in death rates from diarrheal diseases still exist in European countries (around 2,000 per 100,000 infants in Portugal versus 45 per 100,000 in Denmark) or in different ethnic groups living in the same country (South Africa: Negro, around 5,000; Asiatic, around 1,200; white, around 280).

It should be noted that the term "diarrheal diseases" covers a wide range of etiologically distinct infections, e.g.. cholera, bacillary and amebic dysentery, Salmonella infections (food poisoning, typhoid and paratyphoid fevers), enterotoxic infections (Staphylococci, Clostridium welchii), gastro-enteritis due to specific types of Escherichia coli, parasitic infections (giardiasis), and certain syndromes where viruses seem to be involved. But in a large proportion of acute diarrheas no specific pathogen is isolated. Since there may be considerable diversity in the sources, modes of spread, pathogenicity, and geographic distribution of these specfic etiological agents, it is necessary to include microbiological and parasitological investigations in any prospective studies of the diarrheal diseases.

Descriptors

diarrheal diseases
mortality rates
ethnic groups
children
cholera
bacillary
amebic dysentery
Salmonella infections
food poisoning
typhoid and paratyphoid fevers
enterotoxic infections
parasitic infections
infection
malnutrition
Shigellae
Escherichia coli
diarrheal syndrome
nutritional disease.
gastro-enteritis
pathogens
nonpathogens
bowel flora
dehydration
electrolyte imbalance
death
bacteriology

Abstract (continued)

The interrelationship between infection and malnutrition in affecting susceptibility to, and severity of, diarrheal diseases is obvious but imperfectly understood. More detailed studies of nutritional status are, therefore, needed as part of the epidemiological investigation of the dirrheal diseases. Again, the significance of parasitic infestation of the bowel as a possible contributory factor in the diarrheal diseases needs objective assessment.

Some of these points will be elaborated in this section.

The diarrheal diseases studies performed by the World Health Organization Diarrhoeal Diseases Team[2] in several countries are given in summary form...

Age: In general, children were studied. They were usually under two to three years of age, but sometimes were older....
...The data....indicate that Shigellae and pathogenic Escherichia coli were found to be the most common intestinal pathogens in all these studies. ... Shigellae were isolated more frequently in rural than in urban communities...

It is difficult to use data of this kind for international comparison since the method of presentation varies from one report to another....

In practically all reporting countries, the great majority of deaths in which diarrhea is a major symptom are classified under rubric B36 of the ICD, which is entitled "gastritis, duodenitis, enteritis, colitis, excluding diarrhoea of the newborn". ... ...B36 is shown, practically without exception, as a leading cause of death in "developing countries" and as a minor cause in "developed countries". For instance 36 per cent of all deaths in the United Arab Republic are classified under B36 while the corresponding figure for Sweden is only 0.4 per cent.

...a similar comparison is presented for those countries which classify the causes of death according to the ICD... It shows the greater importance of these diseases in the age group 1 to 4 years in all countries, including the developed ones.
... Both of these variables can be considered as indicators of the development of hygiene, social care, and economic power in a community, an increase in the level of any of which is followed by a decrease in mortality from B36, and vice versa. For example the trend of mortality from B36 in the United States from 1900 to 1960 is closely parallel to the improving level of health in this country during the same period.

DISCUSSION

P. J. Collard: . . . diarrheal syndrome across national and cultural boundaries we have to consider more than one disease entity because of the complex reciprocal relations between nutritional diseases and diarrheal diseases.

Abstract (continued)

. . . I would like to add a rule that in underdeveloped countries the higher and so the more depressing the vital statistics, the more reliable they are likely to be!

I sometimes suspect that our concept of infantile gastro-enteritis is a mistaken one, and that it is not useful to differentiate between pathogens and nonpathogens. I would suggest that the child is subjected to a series of cononizations with organisms as its diet changes from milk from its mother and each new colonization, whether or not it includes a recognized pathogen, is liable to cause marked changes in the bowel flora that will in a proportion of cases set up diarrhea. Under certain conditions, in a malnourished child in a tropical area, this may go on to the dehydration syndrome, electrolyte imbalance, and death. This is a hypothesis which is testable and might be well worth trying to check by detailed bacteriology on a small number of children during the first year of life.

Reference

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Disease/Solid Waste
Abstracts

No. DSW-677

Author
Harold W. Wolf

Title
Housefly Breeding in Sewage Sludge

Reference
Sewage and Industrial Wastes

Doc. No.	Contract No.	Date issued
Vol. 27 p. 172-6		February 1955

Abstract

Almost everyone is as aware of the disease vectoring capabilities of the common housefly, Musca domestica, as of the disease potential of sewage sludge. The desirability of preventing the two from coming into intimate contact is obvious. Yet, despite the best efforts of sewage treatment plant operators, this istuation does sometimes occur. Occasionally, in the case of heavy housefly infestations of sludge drying beds, a report will appear in the literature (1).

Many infestations are not reported. The author witnessed two examples in the summer of 1951 at two sewage treatment plants located in the southeastern United States. In one case, the infestation was staggering; a layer of maggots 5 to 6 in. deep was exposed everywhere that the sludge bed was opened for examination. The sludge in both instances was raw.

Fly infestation of sludge drying beds seems to accompany operating difficulties of some kind. Perhaps the plant's digester is overloaded, or accidents or construction activities require the placing of raw or partially digested sludge on drying beds.

...According to Von Zuen et al. (1), "Partially digested sludge in drying beds or lagoons will attract houseflies, and egg deposition will occur as soon as the sludge dries to the extent that flies can rest upon it, usually within 12 hr."...

SUMMARY AND CONCLUSIONS

1. Houseflies will breed in 40-day digested sewage sludge under laboratory conditions. That they will breed in well-digested sludge on drying beds under field conditions was witnessed during a time of extreme housefly population pressure.

Descriptors

breeding
housefly
Musca domestica
disease potential
sewage sludge
sewage treatment plant
sludge drying beds
lagoons

Abstract (continued)

2. The pH, total solids, volatile solids, and moisture content (within the usual range of sewage treatment plant operation) have no significant effect on the numbers of housefly pupae produced. A relation appears to exist between the percentage of volatile solids and pupal size; the higher the volatile solids content of the sludge, the greater the percentage of pupae that are large.

3. The amount of nutrient available in sludge to housefly larvae is apparently reduced by the digestion process as indicated by pupal size.

Disease/Solid Waste
Abstracts

No. DSW-678

Author	G. Lissant Cox, Frederick C. Lewis and Ernest E. Glynn
Title	The Number and Varieties of Bacteria Carried By the Common Housefly in Sanitary and Insanitary City Areas.
Reference	Journal of Hygiene

Doc. No.	Contract No.	Date issued
Vol. 12 pp 290-319		1912

Abstract

There have been in recent years a large number of experiments which prove that the common house-fly (Musca domestica), can carry living pathogenic bacteria both on and inside its body.

The most complete observations of this nature have been made by Graham-Smith (1910) who, artificially infecting flies, caught at random, with pathogenic bacteria was able to recover the latter alive after a long or short interval. He found the length of time varied with the kind of bacterium and its position on or in the fly.

Comparatively few experiments have been made to determine the kinds of bacteria carried by naturally infected, i.e. "wild" flies, and still fewer, probably none in this country, on the number of bacteria which may be carried by such flies as the result of feeding on refuse of all kinds. Some pathogenic bacteria have, however, been isolated from naturally infected flies:

B. typhosus
B. pestis
V. cholerae
Morgan's No. 1 Bacillus
B. para-typhosus A.
B. para-typhosus B.
B. dysenteriae (Flexner)
Colon group
B. tuberculosis

SUMMARY AND CONCLUSIONS

1. Over 450 naturally infected or wild flies (Musca domestica) were caught in Liverpool during September and the first part of October 1911 from

Descriptors

flies
Musca domestica
bacteria
city
suburban
aerobic bacteria
intestinal bacteria
pathogenic bacteria
food poisoning group
milk shops
house-flies
slaughter houses
blue-bottles
food
slum area

Abstract (continued)

different parts of the city. The number and kinds of bacteria carried and contained by them have been investigated.

2. The number of bacteria coming from house-flies whilst struggling in liquid may be very large, varying from 2000, the lowest figure in 5 minutes, to 350,000, the highest figure in 30 minutes. This number may be taken as a measure of their capacity to pollute liquid with their vomit or excrement, or by wallowing int it. The number of bacterial carried inside the fly is very much greater.

3. Flies caught either in insanitary or congested areas of the city carry and contain far more bacteria than those from the more sanitary, less congested or suburban area. The number of aerobic bacteria from the former varied from 800,000 to 500,000,000 per fly, and from the latter from 21,000 to 100,000.

4. The number of intestinal bacteria as indicated by glucose bile salt fermenters is also greater in the insanitary or congested areas, the numbers varying from 10,000 to 333,000,000, than in the more sanitary areas where they carried from 100 to 10,000.

5. Pathogenic bacteria and those allied to the food poisoning group were only obtained from the congested or moderately congested areas and never from the suburban areas.

6. We have examined the morphological characters and cultural reactions of 123 strains. Among those identified were two Streptococci, and several Staphylococci and Sarcinae. 106 were small Gram negative non-spore bearing bacilli, and have been grouped as follows:

Chromogenic group. Two strains of B. pyocyaneus were isolated from a knacker's yard; for the first time, we believe, from wild flies.

Colon group. 41 colonies of this group were picked off haphazard and classified according to McConkey as follows:

B. acidi lactici type	19.5%
B. coli communis type	12.2%
B. neapolitanus type	19.5%
B. lactis aerogenes type	46.4%

Salmonella group. One bacillus gave identical reactions to B. enteritidis of Gaertner except that serological tests were negative.

Morgan's infantile diarrhoea group. One identical to Morgan's No. 1, and many others closely resembling it and Morgan's Nos. 2 and 3 were obtained.

Others fall into Proteolytic, Acid lactose-sucrose (saccharose), and Miscellaneous groups.

7. Flies caught in milk shops apparently carry and contain more bacteria than those from other shops with exposed food in a similar neighbourhood. The reason of this is probably because milk when accessible, especially in the summer months, is suitable culture medium for bacteria, and the flies first inoculate the milk and later reinoculate themselves, and then more of the milk, so establishing a vicious circle.

Abstract (continued)

8. On one occasion we compared the number of bacteria carried by house-flies caught in an eating house opposite the slaughter houses with the number carried by blue-bottles; the latter, as might be expected, was far larger.

9. In cities where food is plentiful flies rarely migrate from the localities in which they are bred, and consequently the number of bacteria they carry depends upon the general standard of cleanliness in that locality. This is well indicated by the fact that flies caught in a street of modern fairly high class workmens' dwellings forming a sanitary oasis (Hornby Street) in the midst of a slum area, carried far less bacteria than those caught in the adjacent neighbourhood.

10. It is clear that flies from the suburbs where infantile diarrhoea is rare carry far less bacteria than those in the city where it is common. It was, nevertheless, impossible in the time at our disposal to correlate exactly the number or varieties of bacteria carried by flies in the city with the number of cases and deaths from infantile diarrhoea in individual streets.

11. As the amount of dirt carried by flies in any particular locality, measured in terms of bacteria, bears a definite relation to the habits of the people and the state of the streets, it demonstrates the necessity of efficient municipal and domestic cleanliness, if the food of the inhabitants is to escape pollution, not only with harmless but also with occasional pathogenic bacteria.

Disease/Solid Waste
Abstracts

No. DSW-679

Author

Joseph Lewis Knuckles, Ph.D.

Title

Studies on the Role of Phormia Regina (Meigen) As a Vector of Certain Enteric Bacteria

Reference **Dissertation Abstracts**

Vol. 20 (4) p. 1490-91

Doc. No.	Contract No.	Date issued
Ph.D. Thesis	Univ. of Conn., 1959	1959

Abstract

Studies have been made on the role of Phormia regina (Meigen) as a vector of Salmonella schottmuelleri (Winslow, Kligler and Rothberg) and Salmonella typhimurium (Loeffler)....

The following conclusions have been made. A threshold of from 13,750-15,000 S. schöttmuelleri is required for its establishment and multiplication in the blowfly. The number of residual S. schöttmuelleri in P. regina following a morning feed-defecation period is sufficient to facilitate indefinite bacterial multiplication.... Salmonella schöttmuelleri and S. typhimurium are capable of multiplying from twenty to forty times a day in sterile flies.... These pathogens may multiply in vivo throughout the blowfly's life. The diurnal multiplication of the former specis is from two to three times greater in blowflies fed a sterile sucrose-human fecal filtrate diet than in flies fed only sterile 0.5 molar sucrose....

Non-infected P. regina may become infected with S. typhimurium and S. schöttmuelleri by ingesting infectious fly feces and serve as vectors of these pathogens....

Salmonella schöttmuelleri may be transferred from instars infected with this species and non-pathogens to all developmental states of the blowfly.... Metamorphosis causes a more rapid decrement in the number of S. schöttmuelleri transferred from infected larvae to and in pupae from one to four days old than during the conversion of last-day pupae to imagines.... Salmonella typhimurium does not appear to be as tolerant as schöttmuelleri toward bacterial competition. Proteus and Aerobacter sp. possess a greater ability to resist bacterial competition and fly metamorphosis than the pathogens used.

Descriptors

Phormia regina (Meigen)
Salmonella schottmuelleri
Salmonella typhimurium
blowfglies
threshold
pathogens
grvrd
vectors
pupae
larvae
Metamorphosis
Proteus
Aerobacter
bacterial competition

Disease/Solid Waste
Abstracts

No. DSW-680

Author

J.T.C. Nash, M.D., D.P.H.

Title

House Flies as Carriers of Disease

Reference

Journal of Hygiene

Doc. No.	Contract No.	Date issued
Vol. 9 pp 141-169	Sept.	1909

Abstract

In 1902 and later years I was so certain from my own observations that flies bred in deposits of house refuse and manure and other organic fermenting refuse, that I actually mentioned such in reports as breeding places, thinking it a well-known fact; but apparently it was not until Newstead (1907) of Liverpool, and Gordon Hewitt (1908) of Manchester studied the habits of Musca domestica that this became an established fact in modern scientific circles in England.... Newstead agrees that outside a town the enormous collections of house refuse must be reckoned a principal breeding place of flies. Both Hamer (1908) and Newstead incriminate accumulations of manure at wharfs, and the former says that in London, horse manure pre-eminently stands out as the chosen breeding ground for house-flies.

...Without the house the principal breeding places of flies are collections of manure and of house refuse. Other sources of flies are piggeries, stables, slaughterhouses, offensive trade premises, midden privies, &c. A spot map I prepared in 1904 shewed that such collections or conditions form a sort of nucleus, round which are grouped fata cases of diarrhoea....

In 1902, I first was struck with the remarkable coincidence between absence of flies and the complete absence of fatal infantile diarrhoea that the flies in each district probably were active "carriers" of infection in each instance.

The literature on the subject of insects as carriers of disease was fully summed up to date in the year 1899 by Professor G. H. F. Nuttall, F. R. S., Quick Professor of Biology in the University of Cambridge.... ...over 350 references are given up to that date....

Descriptors

refuse
manure
organic fermenting refuse
piggeries
stables
slaughterhouses
trade premises
midden privies
diarrhoea
milk
infantile diarrhoea
insects
carriers
anthrax
flies
Musca domestica
tubercle bacillus
leprosy
biting flies
infants

Abstract (continued)

That anthrax was often spread by the aid of biting flies was suspected generally throughout the 19th century....

Nuttall in 1897 made a series of experiments on flies(Musca domestica) which conclusively proved that flies are able to carry the infection of plague and that they die of the disease.

Recent medical literature abounds with statements bearing testimony to the importance of flies when under certain circumstances acting as carriers of the typhoid germ.

Experiments have demonstrated that house flies which have fed on tubercular sputum may serve as carriers of the tubercle bacillus. The spread of leprosy has also been attributed to biting flies.

...numerous further experiments have proved the capacity of flies to convey the infection of cholera and of typhoid fever....

...I had previously drawn attention in the year 1903 to the parallelism of the London diarrhoea curve with the numerical prevalence of flies....

I think it will be agreed after the evidence I have brought forward that I was not unjustified in 1903 in stating that I gave the so-called "harmless" domestic house-fly the first place as a pathogenic or disease-causing agent during the summer months.

Now why do all these epidemic diseases die down when the frosts come? My reply is: - Because frosts kill mosquitoes and flies which are the main agents in transmitting the germs which cause the diseases. The germs themselves are not necessarily destroyed by cold, though they almost cease to multiply. The main point is that no "carriers" are available.

Even adults may suffer from such fly-pollution of milk(I have so suffered myself), but infants are most liable to danger, and least able to withstand the poisonous effects of these chemical changes in milk. Moreover, since milk is their staple food (whether fresh or condensed) they receive the poison in larger relative quantities than adults.

Disease/Solid Waste
Abstracts

No. DSW- 681

Author

U.C. Gupta and V.V. Preobragenski

Title

Trachoma in India Endemicity and

Epidemiological Study

Reference

Journal of the All India Ophthalmological Society

Doc. No.	Contract No.	Date issued
Vol 12 No. 2	p39-[illegible]	July 1964

Abstract

...In India alone trachoma and associated infections account for 3.9 million with impaired vision including 0.57 million economically blind.

EPIDEMIOLOGICAL CONSIDERATIONS

Epidemiological studies were conducted by Trachoma Control Pilot Proect-India (Indian Council of Medical Research) during 1956-63. The investigations included the survey on geographical distribution of the disease in the rural areas of 15 states of the country, studies of influence of the socio-economic and cultural practices of the people on the prevalence rates of trachoma, bacteriological studies with variations throughout the year, the change of pattern of trachoma with seasonal variations and influence of fly population on the incidence and course of trachoma and associated infections during different months.

Geological and certain climatological factors of different regions, which particularly favour the formation and dissemination of irritant dust, are important epidemiological factors responsible for high prevalence of infection in Rajasthan, Gujarat, Punjab and Uttar Pradesh. The dust particles with silica here and other irritant substances give rise to micro-traumatism of the conjunctival epithelium which in turn becomes a suitable host for trachoma or other secondary bacteral infections.

...Probably altitude does not play a very important role in the epidemiology of trachoma....

...heat also does not play any direct role in trachoma epidemiology.

Descriptors

blindness
trachoma
epidemiological studies
geological
climatological factors
dust particles
bacterial infections
altitude
rainfall
temperature
racial susceptibility
religiions
socio-cultural habits
children
sex
disease
women
smoke
seasonal variations
socio-economic factors
poverty
water
soap
eye cosmetics
towel
house fly
flies
geo-physical considerations

Abstract (continued)

Some differences in severity and clinical signs have been noted in communities following different religions. The differences appear to be more on account of different socio-cultural habits which are in practice in accordance with the dictates of various religions followed by different communities.

... children in the age-group 2-4 years had the highest prevalence of active Trachoma...

... There was no difference in the prevalence amongst the two sexes up to the age of 6 years. But beyond this age, it was observed that females suffered more thanmales and had a more severe and protracted form of the disease. The explanation for it may be that women remain more exposed to irritating factors such as smoke and dust and are more neglectful about curative or preventive measures. Besides they remain more in contact with children who have a high degree of infection as seen above.

It has been stated that trachoma is a disease of poverty. Conditions in a poor and illiterate population with cattle and family crowded under the same roof, play their contributory roles in maintaining the endemicity of this contagious disease.

Cooking without a vent fills such huts with irritant smoke. The abundance of dust in the villages, which settles on the eyes and face is not washed away for lack of water and complete absence of soap in most hutments....

Lack of washing and cleaning facilities, unsatisfactory drainage, careless disposal of refuse encourage also the breeding of flies and consequent spread of the disease. The common practice of having a common 'salai' (metal or glass rod) for applying eye cosmetics . . . and the necessity of using one's clothes for wiping the face and eyes, because the villager cannot afford the luxury of a clean towel, contribute further to the contagiousness.

It has been established that an important role is played by the common house fly. Studies undertaken on flies during the preliminary epidemiological surveys have shown that the fly index rises before the onset of the two peaks of seasonal epidemic conjunctivitis. It has also been noted that the age-group of children 2-4 years - which is most exposed to flies as they are not much carried in their mother's arms and at the same time have not sufficient sense and capability to keep the flies off their faces, gets the maximum infection....

Disease/Solid Waste
Abstracts

No. DSW-682

Author
Rene Dubos

Title
Bacterial and Mycotic Infections of Man

Reference
J.B. Lippincott - Philadelphia 1958

Doc. No. Contract No. Date issued

Abstract

ANTHRAX - Epidemiology

Although anthrax is primarily a disease of cattle, sheep, horses and goats, virtually all animals show some susceptibility, and the disease has been detected in nearly every country...

In animals the disease is transmitted primarily by ingestion of contaminated forage or the carcasses of infected animals.... Spores may be disseminated over wide areas by surface, water, animals, birds and insects. Contaminated foods are frequently responsible for introduction of anthrax into new areas; imported bone meal was the cause of the extensive outbreak in themid-western United States in 1952 (Stein and Stoner, 1953).... The spores may remain viable for many years in soil...

In the United States approximately 50 cases of human cutaneous anthrax are reported annually; additional unreported cases also occur.... Man is infected by contact with infected animals (agricultural anthrax) or contaminated animal products (industrial anthrax)....

THE SALMONELLA - Epidemiology

The source of all salmonella infection is the reservoir of organisms living in the tissues of human beings or animals. Infection occurs through food, milk or water contaminated with infected feces or urine or by the actual ingestion of the infected animal tissues. The hosts which harbor the organisms may be clinically recognized cases or sick animals, subclinical cases, or carriers.... Infection with most salmonella apparently requires the ingestion of large numbers of organisms, but

Descriptors
anthrax
B. anthracis
salmonella
S. typhosa
flies
bacillary dysentery
sh. flexneri
sh. sonnei
sh. dysenteriae
Shigella
plagues
P. pestis
fleas
erysipeloid
swine erysipelas
erysipelothrix
cholera
leptospirosis
L. icterohaemorrhagiae
L. canicola
L. grippotyphosa
L. hebdomadis
L. pomona

Abstract - continued

in the case of S. typhosa relatively few bacilli are sufficient to cause typhoid fever....

Water may be contaminated with infected feces.... Oysters and shellfish may also cause smaller outbreaks when taken from water contaminated with sewage.

Endemic typhoid fever and infections with other salmonella are now much more common than epidemic typhoid fever in parts of the world where sanitary measures are applied to protect water and food supplies. In these instances, infection usually is due to contamination of food by a human being or an animal excreting the organisms; or to the ingestion of the improperly cooked meat of an infected animal; or of foods containing contaminated egg products. In some instances flies carry infected excreta to the food or even become infected themselves with the bacilli and deposit them on the food....

BACILLARY DYSENTERY - Epidemiology

Bacillary dysentery is traditionally regarded as a disease of the tropics; however, it has a world-wide distribution in actual fact....

The source of infection is essentially man. The Shigella are strict parasites, and no natural animal reservoirs have been detected. Their natural habitat is the gastro-intestinal tract of man.... ...the organisms are excreted in large numbers during the acute phase of clinical dysentery.... the patient with a mild diarrhea or with no symptoms whatsoever may also be acting as an excretor of the organism.... ...they may persist during convalescence or even longer. The development of a true carrier state is of rare occurrence...

The spread from man to man may take place by a variety of methods. The contamination of human fingers with fecal material containing dysentery bacilli is the first step in the direct transfer of organisms from one individual to another (Hutchinson, 1956). The contamination of inanimate objects such as toilet seats, door handles, toys, pottery and glassware, which are used in common by many people, represents an intermediate step in the process. Outbreaks occurring in institutions such as asylums or enclosed military groups are usually due to this type of spread; as a general rule, as standards of personal hygiene improve, the incidence of Shigella infections diminishes....

Spread from man to man may occur more indirectly through the medium of contaminated food or water supplies. Foodstuffs are usually infected by the dirty fingers of food-handlers or by flies which have access to fecal material containing dysentery bacilli....

PLAGUE - Epidemiology

Plague is endemic in certain parts of India and is constantly present in Kurdistan, Burma, Java, China, Madagascar and South, Central and East Africa. It occurs sporadically in Egypt, North Africa (Tunis), Iraq, Iran, Siam and Indo-China (Pollitzer, 1954). Local rat epizootics, occasionally accompanied by a few human cases, have been noted in European seaports from time to time, the most recent ones being on Malta and Sardinia. The plague foci in American constitute a potential source of epidemic plague. Watchful, unceasing research and inspection are always

Abstract (continued)

needed in the enzootic plague areas if large outbreaks are to be avoided. The United States has known rat and human plague since the beginning of the century: San Francisco (1900 and 1907), the Gulf States - Louisiana, Texas and Florida (1914 to 1920) - and Los Angeles (1924 to 1932) were affected in turn. After a 20-year hiatus, the rat disease erupted in Tacoma, Wash., in 1943 and 1944. Rural endemic foci are established on Maui and Hawaii. Human plague cases have been few since 1934 in California and the 15 Western States extending as far east as Kansas, Oklahoma and Texas, where in 138 counties pockets of enzootic and epizootic plague have been recognized in ground squirrels, chipmunks, prairie dogs, wood rats and harvest mice. Since 1908, 70 cases (45 deaths) have been traced to wild rodents in these areas (Link, 1955).

There are two main reservoirs: urban plague, maintained by commensal rats and mice, and rural plague, maintained by wild rodents. Either may give rise to bubonic or pneumonic plague, the epidemiology undergoing corresponding changes. Urban plague occurs in densely populated unsanitary areas... Rural plague among hunters, workers in woods, and children, transmitted through rodent bites or handling, and perhaps infrequently by insect bies, is sporadic, bubonic plague, which may give rise to small or large epidemics of pneumonic plague....

...Many complex factors control the periodic waves, but fluctuations in endemic areas are always associated with variations in the climate. As the rodent population in urban areas is reduced by a rampant epizootic, and the fleas seek new hosts, persons of all ages and both sexes contract bubonic plague. General health, nutritional status and living conditions, including overcrowding, are determining factors in the mortality rates; there does not seem to be any racial immunity. ...

Strains of P. pestis secured from man, rats, wild rodents and fleas from every corner of the earth are biologically identical and remarkable homogeneous in virulence and infectiusness....

Plague may be introduced into a rat population by spread from one section of a city to another, by spread at a distance through transportation of rats and rat fleas along lines of communication with merchandise or by partial migration of rodents, as in India (Sharif, 1951). Unless there is a considerable population of infected Rattus rattus, plague is never transmitted to man to any serious extent.... Rats surviving the epizootics have acquired resistance to infection.... Epizootics cannot arise until a new generation of susceptible rats has grown up. It need hardly be emphasized that where houses are mainly constructed of soft material/ and where garbage is disposed of carelessly, conditions are ideal for rat multiplication and potentially for explosive outbreaks of plague.

Abstract (continued)

... In the United States rural plague was discovered in 1908, and since 1934 epizootics have broken out among squirrels, prairie dogs, rabbits and pack rats in 15 Western States. The collection of ectoparasites from sick and healthy rodents and injection of emulsions of these ectoparasites into healthy guinea pigs has revealed enzootic and epizootic plague among 50 rodent species.

Recurrence of plague in commensal rats in countries where the principal natural reservoirs are squirrels or gerbils without notable repercussions in the nearby human populations is not uncommon.... It is probable that they perpetuate the infection, and their fleas may spread it to commensal rodents....

The indispensability of the vector, the flea, in the rodent-flea cycle is well known.... The climate and the size of the rat population control the density of the flea population...

Most investigators agree that primary pneumonic plague originates from a person ill with bubonic plague who has plague pneumonia of metastatic origin. This first pneumonic case may then lead to others. The patient may transmit the agent through droplets of sputum during coughing spells...

TULAREMIA - Epidemiology

Tularemia has been reported from many parts of the United States; some areas are much more heavily infected than others. There were from 11 to 25 cases per 100,000 population in Arkansas during the period 1937 to 1951. In 5 New England states only 20 cases have been observed since the discovery of the disease, and in Vermont none at all. In the U.S. between 1924 and 1950 there were 25,294 cases (Olsufev, 1954), and between 1944 and 1955, the U.S.Public Health Service received reports of 10,865 cases. Contact with cottontail rabbits was responsible for 65.5 per cent (Jellison and Parker, 1945). In California 81 per cent were attributed to contact with wild jack rabbits (Simons et al., 1953). Tularemia has been reported from the U.S., Alaska, Canada, Venezuela, Mexico and Japan, and since 1926 epizootic waves have spread from Siberia to Turkey, and over most of Europe.

It is an essentially sporadic disease. It may become epidemic when a number of persons take an infected meal,. . . when contaminated drinking water is consumed (Schmidt, 1947; Parker et al., 1951) or when deer flies are particularly infective, as when 30 of 170 residents of a boys' camp were infected by bites (Hillman and Morgan, 1937)....   ...human-to-human infection has not been recorded.

The sources of infection recognized in North American are: (1) wild rabbits (rabbit fever), (2), terrestrial rodents, (3) the biting fly (Chrysops discalis), (4) ticks (glandular tick fever), (5) semi-aquatic mammals such as muskrats and beavers, (6) contaminated water, (7) game birds and (8) sheep (Jellison and Kohls, 1955)....

Abstract (continued)

Seasonal occurrence with its peaks in summer is associated with rabbit hunting and arthropod vector activity in the Western States. Natural infection occurs in every month of the year but is most prevalent in the summer in the West. There, ticks are particularly dangerous from March to August, deer flies from June to September....

The key factors in the transmission are ticks, lice, fleas and mites, these keep the infection alivw in vertebrates belonging to the Rodentia (Leporidae, Muridae, Sciuridae), the Canidae and the Ovidae. For its propagation in nature B. tularense depends on the wood tick (Dermacentor andersoni) and the dog tick (Dermacentor variabilis, D. occidentalis, Haemaphysalis leporis palustris), which feed on rabbits and other rodents....

ERYSIPELOID - Epidemiology

Erysipeloid in man is primarily an occupational disease, seen in individuals handling meat, fish, poultry or shellfish.... However, erysipeloid also has been observed as a nonoccupational disease in sproadic cases.

Although in man inoculation almost invariably takes place through broken skin, in swine other portals of entry apparantly are possible. Rowsell, in experimental swine erysipelas, found that various routes of experimental infection produced tonsillar carriers in 92 per cent of the pigs. He believes that natural infection in swine probably occurs by the oral route, in which case danger to the herd of the tonsillar carrier of Erysipelothrix is obvious.

CHOLERA - Epidemiology

Cholera has been endemic in India for many years. In 1817 it started on the first of a series of epidemic waves which continued irregularly throughout the 19th century. Each pandemic extended further from the endemic source, until Europe was reached (1830) and finally America (1832). There has been no cholera in America since 1892 or in Europe since 1925. In 1947 Egypt was reached. Epidemics continue to appear with some regularity in Asia. In India there were 337,000 deaths from cholera in 1930. More than 200,000 cases were reported in India and Pakistan in 1950. Recently, small epidemics have occurred in China, and the disease seems to have become endemic in Burma, Thailand and French Indo-China.... The world-wide dissemination of cholera in the early epidemics closely followed shipping lanes, overland trade routes and pilgrim migrations.... Cholera is spread by contaminated water, food, flies and by direct contact....

Abstract (continued)

LEPTOSPIROSIS - Epidemiology and Preventive Measures

Leptospirosis is primarily a zoonosis, and man is an aberrant host. Wild rodents appear to be the principal reservoirs; it is not clear whether certain domestic animals, known to be frequently infected with leptospira, should be regarded as primary or secondary reservoirs. The organisms are communicated to man either directly, or indirectly by way of water or soil, although leptospira do not survive long in nature outside an animal host. The organism presumably enters the body through small breaks in the skin or through intact mucous membranes, particularly the conjunctiva (Stavitsky, 1945).

... L. icterohaemorrhagiae is found all over the world in the common brown rat and in some areas in other species of rats but rarely in other rodent species; L. canicola has been found principally on dogs but rarely in rats; L. grippotyphosa and L. hebdomadis are found almost exclusively in the field mouse and the hamster; L. pomona has been found principally in pigs, with perhaps secondary infection of cattle, but rarely in rodent species; ...
Leptospiral infection of domestic animals has become associated with certain serotypes, but the more infection is recognized the more exceptions to the general rule are discovered....

...The commonest epidemiologic pattern is a stiuation in which man comes into frequent contact with water contaminated by leptospira-containing urine of infected rodents or domestic animals.... Thus the risk is comparatively great among sewer and mine workers, soldiers in trench warfare, bathers in swimming holes and canals, workers in cane and rice fields, and poultry dressers....

... No effective vaccine is available for use in man or domestic animals.

Disease/Solid Waste
Abstracts

No. DSW-683

Author Harry V. Warren, Robert E. Delavault, and Christine H. Cross

Title

Geological Considerations in Some Disease Patterns

Reference

Archives Environmental Health

Doc. No.	Contract No.	Date issued
Vol. 13	pp412-13	October 1966

Abstract

In 1957, two small villages in the Apennines, not far from Rome, commenced drawing water from a new well. Within a few years one half of the population had been operated on for carcinoma, chiefly of the stomach or intestines. By 1965, the local practitioner, a Dr. Giacomo Michelangeli[1], had been able to trace the trouble to a newly developed supply of water that was found to contain more than 50 times the radioactivity of the water that had been used previously, and which was, itself, already near the upper level of tolerance in radioactivity.

In 1960,... Dr. E. D. Allen-Price[2], ... in West Devonshire... reported ... that there was an extraordinary spradic distribution of cancers in West Devon..... ...the presence of significant amounts of radon 222 in some of the water supplies of the area has been established. Furthermore, lettuces from 80 localities in West Devon have been analysed, and some have been found to carry abnormally large amounts of lead and other base metals. Other workers have suggested that trace elements in soil may be related to cancer....

... Warren and associates reported on studies they had made of vegetables and soils collected from areas where the prevalence of multiple sclerosis was abnormally high, and also from areas where, on the basis of the available evidence, the prevalence must be considered average. These studies revealed a most suggestive correlation between abnormal concentrations of some one or more heavy metals, and frequently of organic matter, in the soils of areas where the prevalence of multiple sclerosis was abnormally high.

Descriptors

carcinoma
stomach
intestines
radioactivity
cancers
radon 222
lead
metals
trace elements
soil
chromium
arsenic
asbestos
multiple sclerosis
heavy metals
foods

Abstract (continued)

Whether or not there is a relationship between abnormal concentrations of some metals in foods and soils with unusually high prevalences of multiple sclerosis is a question which demands a scientific answer.... It may well be that, in appropriate concentrations, many ... elements, such as copper, zinc, polonium, and molybdenum, are equally significant with respect to human health.

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Disease/Solid Waste
Abstracts

No. DSW-684

Author
R. E. Eckardt, M.D., Ph.D., F.A.C.P.

Title
Industrial Carcinogens

Reference
Modern Monographs in Industrial Medicine

Doc. No.	Contract No.	Date issued
Grune & Stratton	New York	1959

Abstract

LUNG

General Considerations

It is probable, although not positively proven, that occupational lung cancer arises as a result of the inhalation of some carcinogen. Experimental data in animals have shown that the incidence of lung tumors may be increased without the production of skin tumors, by painting different sites of the animals body. This suggests, but does not establish, that materials absorbed through the skin or other ways than by inhalation, may contribute to lung cancer production. On the other hand, the fact that animals did not develop lung cancers when placed in chambers with a sufficient concentration of carcinogen mist to produce skin cancers, argues somewhat against this. These latter experiments, furthermore, strongly suggest that multiple factors may be at work. Clinical evidence is also accumulating which suggests that non-carcinogenic irritants may produce squamous metaplasia of the bronchial epithelium which, in turn, is acted upon by carcinogens to produce squamous carcinoma of the bronchus. If the latter is truly the mechanism of lung carcinogenesis, then the control of occupational lung cancer may be brought about in one of three ways: (1) Elimination of the non-carcinogenic irritant causing squamous metaplasia, (2) elimination of the carcinogen, or (3) partial elimination of (1) and (2), reducing each to levels where even in combination they are inactive....

It seems highly probable that the lung cancers seen in the chromate industry have resulted from the inhalation of a fume, a mist, or a fine dust of some material in the operation. Of the three, from the descriptions of the operations given, it

Descriptors

lung
cancer
carcinogen
lung cancers
irritants
chromate
industry
dust
gas
asbestos

Abstract (continued)

seems that inhalation of a fine dust was involved. . . .

...lung cancer resulting from asbestos ... is the result of the prolonged inhalation of asbestos dust, so that its control lies in the control of the dustiness of the operation....

Disease/Solid Waste Abstracts

No. DSW- 685

Author

Title Typhoid Traced to Bathing at a Polluted Beach

Reference

Public Works

Doc. No.	**Contract No.**	**Date issued**
V. 92 , p. 182, 184		May 1961

Abstract

"A rapid sequence of eight notifications during the early part of 1958 was . . . recognized as most unusual; . . . The vehicles of infection incriminated in other outbreaks elsewhere received specific attention. These included contact with known cases or carriers, and food such as ice cream, shellfish, desiccated coconut, prepared meats and salads. None of these appeared to be implicated; but it was discovered that several of these early patients had bathed regularly at City Beach. . . . not only had five of the first eight cases bathed at City Beach, but they had done so more frequently and for longer periods than the average beach visitor. . . .

"The status of the sea water at City Beach was immediately looked into, and a number of disturbing disclosures resulted:

"1. The treatment of sewage at the main metropolitan plant in Subiaco was incomplete.

"2. The outfall from this sewage plant lay approximately one mile south of the City Beach bathing area.

"3. The weekly samples of City Beach sea water had contained a very high concentration of fecal organisms on at least two occasions during February.

"4. An aerial photograph showed a zone of ocean discoloration originating at the outfall and involving the City Beach bathing area; and swirls indicated that the outfall pipe (about 300 feet long) was broken in two places.

"During the next three weeks seven additional typhoid cases occurred. Five of these had been associated with City Beach prior to its closure; while one of the remaining two was traced to a carrier. . . .

Descriptors

typhoid fever
polluted water
beach
sea water
sewage
fecal organisms
carrier
Salmonella typhi
bathers

Abstract (continued)

"Thus, of the 15 cases which comprised the outbreak, 10 were associated with City Beach and one was due to a carrier. . . .

"The evidence incriminating City Beach was further strengthened when the results of "phage" typing of the strains of Salmonella typhi recovered from the patients concerned, became known. These had been sent to Melbourne for identification and it was found that the causative organisms involved were of five different types. A 'mixed bag' such as this eliminated the possibility of the outbreak being due to 'carrier contamination' of some common foodstuff and strongly indicated a conglomerate source of infection such as sewage-polluted water.

. . . convincing evidence to incriminate bathing in polluted sea water as a cause for outbreaks of intestinal disease is extremely hard to find. . . . The self-purifying effects of sea water are numerous. Dilution, aeration, salinity, sunlight, predatory bacteria and other factors combine to bring about the destruction of typhoid and other organisms which are discharged into the sea. For this reason it is virtually impossible to demonstrate the presence of pathogenic bacteria in small incidental samples of sea water examined by standard techniques. On the other hand it is known that the infective dose of Salmonella typhi is minimal and minute, and that typhoid organisms are capable of surviving in sea water for appreciable periods. . . .

Disease/Solid Waste
Abstracts

No. DSW-686

Author
R. R. Parker, Edward A. Steinhaus,
Glen M. Kohls

Title
Tularemia in Beavers and Muskrats and the Contamination of Natural Waters and Mud by Pasteurella tularensis in the Northwestern United States

Reference
Journal of Bacteriology

Doc. No.	Contract No.	Date issued
Vol. 45, p. 56-57		1932

Abstract

During the early spring and summer of 1942, observations were made of a tularemia epizootic which affected beaver and muskrat populations in parts of Montana, Wyoming, Idaho and Oregon. The water and mud were found contaminated with Pasteurell tularensis in 3 of the streams in which animals died of tularemia. Human infections resulted from contact with diseased animals in at least 6 localities, but no definite evidence was obtained of infection from contaminated water.

... there is a definite likelihood of water contamination by P. tularensis in any stream in which tularemia is affecting muskrats or beavers, or both, (3) that under favorable conditions water contamination may persist for considerable periods (at least 7 months), ...

Descriptors

beaver
tularemia
muskrat
Pasteurella tularensis
human infections
water
water contamination
fur industry
trappers
conservation officials

Disease/Solid Waste
Abstracts

No. DSW- 687

Author
James O. Mason and Wilbert R. McLean

Title
Infectious Hepatitis Traced to the
Consumption of Raw Oysters, An Epidemiologic Study

Reference
American Journal of Hygiene

Doc. No.	Contract No.	Date issued
Vol. 75 pp. 90-111		1962

Abstract

During the first 3 months of 1961, 80 cases of infectious hepatitis occurred in Mississippi and Alabama which were traced to the consumption of raw oysters. The source of these oysters was a localized area at the mouth of the heavily contaminated Pascagoula River.... ...nationwide surveillance ... resulted in the identification of 4 additional cases in residents of New York, New Jersey and Pennsyvlvania. These individuals ate raw oysters while visiting in Pascagoula and Mobile during the Christmas holidays.

Mode of transmission -
Several aspects of the Pascagoula outbreak such as the configuration of the epidemic curve, the unusual concentration of cases in adults, the preponderance in males, and the absence of early geographic or school localization suggested that the outbreak was transmitted through a common source. This impression was strengthened when it was learned that 40 of the 60 city cases had no known contact with a case of hepatitis prior to onset of symptoms. The 20 cases with a history of contact had late onsets, all but two occurring after the epidemic peak.

Associated gastroenteritis. The patients frequently reported the development of gastroenteritis 15 to 24 hours after the ingestion of oysters. Approximately 40 per cent of the patients and numerous other individuals who did not develop hepatitis after eating oysters volunteered this information. Symptoms consisted of nausea, severe abdominal cramping, and profuse watery or, sometimes, bloody diarrhea. The duration of the illness ranged from 3 to 7 days.

Descriptors

infectious hepatitis
oysters
raw oysters
transmission

milk
water
public eating establishments
raw shellfish
gastroenteritis

sewage treatment plant
river
fried oysters
oyster stew

Abstract (continued)

... During the 1950's, Pascagoula nearly doubled in size and in so doing overtaxed its sewage treatment plant. Increasingly larger volumes of raw sewage were bypassed to enter directly into the Pascagoula River 1 mile above its mouth.... The shipyard at the mouth of the river employing approximately 2,500 workers had no connection with the municipal sewage system and therefore contributed to the local contamination by emptying sewage directly into the river.

The oyster-related cases described in this paper are clearly linked to the ingestion of raw oysters. Family members eating fried oysters remained well while some of those eating or even "nibbling' on one or two of the same uncooked oysters developed hepatitis. Such histories were repeated time after time. Frying, therefore, as generally practiced, appears to inactivate the virus.

One adult patient who denied eating raw oysters had eaten oyster stew prepared by heating milk and spices to the boiling point and some time afterward adding refrigerated oysters to the mixture. The amount of cooking received by these oysters wasminimal.... No cases were traced to the consumption of oyster stew or gumbo, loaf, or other thoroughly cooked oyster preparations.

Disease/Solid Waste
Abstracts

No. DSW- 688

Author

Wm. Bridge Cooke

Title

Fungi in Polluted Water and Sewage

Reference

Sewage and Industrial Wastes

Doc. No.	Contract No.	Date issued
Vol. 26	p.539-49, 661-74, 790-94	1954

Abstract

I. Literature Review

In a primary treatment plant at Atlantic City, N.J. solids were settled out of sewage in tanks and pumped to drying beds. As soon as the sludge could be handled easily it was removed to vacant lots or under sheds. After further drying it was stored in darkened buildings where molds were encouraged to grow. It was not indicated which molds were present or whether the material with its microbial populations, which must have included bacteria, was sterilized before its sale as "fertilizer". Wigley (38) indicated that this process was patented.

Reynoldson (22) found that in a double filtration plant at Huddersfield, England, there was a correlation between growth of the mold Oospora and the fly Psychoda, which followed a temperature pattern. In the primary filter there was heavy fungal growth with ponding and sludge accumulation, but with a lowered fly production. In the course secondary filter there was no ponding, the thickness of the fungus blanket was greater in winter and spring, and the flies followed a normal pattern with temperature, except for a late summer period when they were reduced, apparently by lack of food.

II. Isolation Technique

Sabouraud's medium is a popular medium for the isolation of fungi from various habitats. It is used most frequently in medical mycology and it was hoped it would act as a type of selector of pathogenic fungi.

Descriptors

fungi
sewage
solids
molds
Oospora
fungus
pathogenic fungi

water
polluted water
sludge
fertilizer
Psychoda
flies
Aspergillus fumigatus

Abstract (continued)

III. Fungi in a Small Polluted Stream

On the basis of the 12-month survey it is indicated that certain species can tolerate the presence of pollution and low amounts of dissolved oxygen better than others and better than had previously been supposed. This is also true of the ability of many species of non-aquatic fungi in their ability to exist in an aqueous habitat. The six species which exhibit a constancy value of 12 on the basis of monthly sampling also exhibit a constancy value of 8 on the basis of appearance in all 8 stations, and 32, 31, or 29 on the basis of occurrence in the 32 habitats samples. Table III summarizes these data.

Aspergillus fumigatus is a common soil mold of world-wide distribution which is also an etiologic agent of aspergillosis in man and animals.

Disease/Solid Waste Abstracts

No. DSW- 689

Author

Chandler, Asa and C. P. Read

Title

Introduction to Parasitology

Reference

N. Y., John Wiley and Sons

Doc. No.	Contract No.	Date issued
10th ed.		1961

Abstract

. . . the Diptera are as important as all other arthropods combined as far as human disease is concerned, for in this order are included the normal transmitters of malaria, African trypanosomiasis, leishmaniasis, Oroya fever, various types of filariasis, yellow fever, dengue, sandfly fever, and numerous encephalitis and other virus infections. Without their dipteran transmitters these diseases would probably disappear. Other diseases, such as anthrax, yaws, and pinkeye, are mechanically conveyed by flies, and the housefly and other nonbiting flies are involved in the mechanical transmission of all kinds of filth diseases. Besides all this, the Diptera include nearly all the insects which infect wounds, skin, nasal passages, or digestive tract in the larval (maggot) stage.

. . . The species of Phlebotomus whose life histories have been studied lay their eggs in crevices in rocks, masonry, or crumbling buildings, between boards in privies or cesspools, in rubbish, or in the burrows of animals or in deep soil cracks, where there are moderate temperatures, high yumidity, and darkness. . . .

Sandflies are of great importance as the transmitters of the various types of leishmaniasis, of a filtrable virus disease called three-day fever, or more commonly sandfly or papatasi fever, and of Oroya fever. . . .

Biting Midges or No-see-ums - Heleidae

. . . the majority of species that attack man and animals belong to the genus Culicoides. . . .

. . . They become active at dusk, but if disturbed many of them will bite in the shade, even on bright days. Both sexes are attracted by lights. They are much more active fliers than Phlebotomus, and are said to go as far as half a mile in search of a host, . . . Most of the species appear to prefer cattle, camels, or

Descriptors

diptera
flies
sandflies
midges
horseflies
hornflies
stableflies
houseflies
blowflies
eye flies

malaria
African trypanosomiasis
leishmaniasis
Orova
filariasis
yellow fever
dengue
sandfly fever
encephalitis
virus infections

anthrax
yaws
pinkeye
filth diseases
trachoma
myiasis

Abstract (continued)

or other animals as food, but some species readily attack man.

. . . some species breed in rotting vegetation.

. . . The bites of *Culicoides* produce nettlelike pricks which are sometimes followed by burning sensations and intolerable itching; in many sensitized individuals the bites last longer and are more painful than mosquito bites, . . . The ability of these insects to go through ordinary mosquito screens makes them particularly obnoxious. . . .

Midges as Disease Carriers

Culicoides serve as intermediate hosts for three filarial worms of man, *Dipetalonema perstans*, *D. streptocerca*, and *Mansonella ozzardi*, and at least two filariae of animals, *Onchocerca reticulata* of horses and *O. gibsoni* of cattle. . . .

Horseflies (Tabanidae)

. . . Many tabanids breed in wet or damp places or without a covering of water; some breed in rotting wood in treeholes or logs; others breed in relatively dry soil. . . .

. . . Tabanids cause serious injury to cattle by annoyance and loss of blood, . . . This, together with loss from *Stomoxys* and hornflies . . ., is sufficient to seriously reduce weight gain and/or milk production. . . . Even human beings may suffer severely from bites of tabanids, particularly deerflies.

. . . Tabanids are of importance in connection with the transmission of some of the trypanosomes of animals. . . . Trypanosomiases of man are probably much less frequently transmitted by tabanids and Stomoxys than are those of animals. . . .

Hornfly (Siphona irritans). This . . . fly . . . causes endless misery to cattle; no other pest, except possibly screwworms, is, as inimical to the contentment of cows. The fly sometimes attacks other domestic animals but rarely man. On ranches in the southwest an average of 4000 flies per animal is frequent. . . . The irritated animals become restless, cease to graze, and lose vitality not only from loss of blood but also from loss of food. The resulting heavy loss of meat and milk is inevitable. . . . Fortunately, since they stick fairly closely to one animal, hornflies do not transmit diseases as frequently as stable flies and tabanids.

Hornflies usually leave the animals only to lay eggs. They swarm to a fresh dropping, crawl under it and lay their eggs, and return to the animal in 5 to 10 minutes. . . .

Stableflies (Stomoxys). . . . *S. calcitrans*, the stablefly or dogfly . . . , is an annoying pest of animals and man all over the world. In some outbreaks the stablefly may cause as much loss in beef and milk as the hornfly. . . .

Stableflies breed by preference in decaying straw or rotting vegetable matter or straw mixed with manure, particularly of horses. An unusual scourge of them, . . . occurs on parts of the Florida and New Jersey coasts where washed-up piles of seaweed, trapped in lakes behind sand dunes, afford ideal breeding places, especially in September. Later, in December, extensive breeding occurs in piles of peanut litter and celery strippings farther inland in Florida.

Stableflies frequently begin a meal on one animal and finish it on another, so they may mechanically transmit diseases such as trypanosomiasis, anthrax, vesicular stomatitis, etc., just as do tabanids . . . *Habronema* larvae may cause human conjunctivities, when liberated by flies, in the sore eyes of children. . . .

Abstract (continued)

Housefly (Musca domestica)

. . . In some areas about 99% of flies in houses are usually of this species. . . .

The housefly is a particularly important transmitter of filth germs, especially those affecting the eyes and the alimentary canal. In Egypt, when flies were practically eliminated from certain villages by chemicals for a few months, pussy eyes, due to gonococcal infections, were strikingly decreased. The relation to enteric diseases is due to the fact that the fly frequents privies and feces for egg laying, and dining tables and kitchens for food. . . . It is probably the greatest single factor in the epidemiology of bacillary dysentery, and is an important one in other enteric diseases of both man and animals. In addition, houseflies have been found to pick up and harbor the virus of poliomyelitis, though there is still no evidence that they are an important factor in causing the paralytic form of the disease; their possible role is discussed on pp. 227-228. Helminth eggs can be carried externally and also internally if under 50 μ in diameter, so houseflies as well as blowflies could be a factor in causing hydatid infections, (see p. 362).

The housefly lays its eggs by preference in horse manures, but will breed in almost any kind of animal or vegetable wastes, in pen litter, or in slop-soaked soil. . . .

It is obvious that we must return to basic sanitation for fly control - sanitary disposal of feces, frequent thin spreading of manure on farms, burial or burning of garbage or other materials (e.g., at slaughter houses) where flies breed.

Blowflies

Although the housefly is the most important mechanical carrier of pathogenic organisms, many other flies may also serve in the same capacity. Attention should be called to the blowflies (Calliphoridae), some of which breed in dung but most of which breed in carcasses and garbage. They may carry not only germs of enteric diseases but also larvae are deposited in the wool or fur of the host; . . .

Eye Flies (Chloropidae)

. . . most of those annoying to man breed in excrement or decaying organic matter. . . .

. . . many of them are habitually attracted by the skin and natural orifices of man and animals, lapping up perspiration, excretions, exudations of sores and wounds, or blood from scratches or insect bites. Some species appear to be especially attracted to the eyes and lachrymal secretions of man, whence their name.

. . . The habits of these insects, therefore, render them particularly dangerous mechanical carriers of eye infections and of various diseases of the skin and mucous membranes as well. . . .

Abstract (continued)

Relation to eye diseases. In the Coachella Valley of California Hippelates collusor (Fig. 225), and in parts of Florida H. pusio, are a sufficient nuisance to be limiting factors in the development of the country. . . . In one high school 1500 children were reported as suffering from "pinkeye" in 1929; 50% of the young children of the region had some conjunctivitis, and 10% had chronic trachoma.

Eye flies and yaws. Members of the family Chloropidae are an important, perhaps one of the most important, factors in the transmission of yaws. . . . Nichols in 1912 was convinced that eye flies, Hippelates flavipes, were responsible for the majority of cases of yaws in the West Indies, and similar views have been expressed by a number of other writers in the West Indies and Brazil. In Trinidad this species is called the "yaws fly".

. . . There is a close correlation between the distribution of this fly and that of yaws in the West Indies. . . .

In Assam, Fox in 1921 showed that epidemics of another spirochetal infection, Naga sore (see p. 221), are associated with plagues of Siphunculina funicola, which swarm on the sores and mechanically transmit the infective material.

. . . man and animals are attached not only by the numerous adult flies discussed in the last two chapters but also by the maggots or larval stages of many species of flies. Such an infestation by fly maggots is called myiasis. Nearly all cases are caused by larvae of flies of the suborder Cyclorrhapha . . . .

The flies most frequently concerred in myiasis belong to two large groups, the Muscoidea (see p. 668) and the botflies. . . .

Disease/Solid Waste Abstracts

No. DSW- 690

Author

L. Kartman, M. I. Goldenberg, and W. T. Hubbert

Title

Recent Observations on the Epidemiology of Plague in the United States

Reference

Amer. J. of Pub. Health, V. 56, No. 9,

Doc. No. Contract No. Date issued

Sept. 1966, pp. 1554-1562

Abstract

A seemingly paradoxical situation exists today in the United States with respect to the status of bubonic plague. On the one hand, we recognize that plague is a serious world health problem, with cases occurring in 1965 in North and South America, in Asia, and in Africa. In that year there were at least 766 reported cases, with 95 of these being fatal.

On the other hand, we have had only about two cases of plague, on the average, each year in the United States, if we exclude those cases which resulted from the few urban epidemics this country has seen. This very small case rate, together with the fact that the disease can be cured if diagnosed and treated properly, would lead one to believe that plague does not present any great problem to the health of this country.

But this is not the case. Plague exists, in its sylvatic form, in over 130 countries of 15 western states. Potentially, it may break out among humans at any time, as it did most recently in New Mexico and California in 1965.

...The reservoir of enzootic infection, entrenched in the vast hinterland of our western recreational regions, constitutes a disease potential that must be recognized by public health and medical authorities.

During the period from 1956 to 1965, a total of 20 cases of human plague were reported in the United States. All of these were associated with foci of sylvatic plague in four western states (New Mexico-13, California-4, Colorado-2, Arizona-1).

Wild rodent species believed to be of prime importance in the maintenance of sylvatic plague are often able to withstand inoculation with doses of plague bacilli that are hundreds of thousands of times greater than the lethal dose for man or the domestic rat.

Very marked differences in the ability to survive infection with virulent P.

Descriptors

plague
infection
flea
stress situation
dogs
case rate
dose
vector
resistance
reservoir
wild rodent
P. pestis
Navajo Indians

Abstract (continued)

pestis cells have been found between species, and in some cases, between different populations within a species.

Within each of the above species, a similar degree of susceptibility to plague has been exhibited, regardless of the geographic area. However, it cannot be assumed that the susceptibility pattern established in one area necessarily will hold true for another.

...We have found that the lethal dose among the hibernating animals was more than 20 times the number of organisms required to kill normal controls. ...We have seen squirrels come out of hibernation and then sicken and die of plague infections 19 weeks after being inoculated.

The maintenance of enzootic plague in natural foci depends in a fundamental way upon the commingling of insusceptible and susceptible individuals within populations of single species of rodents, and upon its polyhostal character, i.e., the circulation of the plague organism in two or more rodent species in a given locality during a given period. Some observers have maintained that plague basically is monohostal.(15) Our work has supported the idea of its polyhostal nature as suggested by Kalabukhov (16). . . .

The commingling of rodent or other mammalian species of differing susceptibility is of basic epidemiologic importance because the insusceptible species does not succumb to plague, whereas it acts as a reservoir of the infection which, when transferred to a susceptible species, results in clinical disease that may in turn be a source for human infection via the flea or by direct contact. . . . Investigation revealed a close association of the cottontail rabbits with wood rats, white-footed mice, grasshopper mice, cotton rats, and kangaroo rats. . . .

The commingling of wild rodents and domestic rats in an enzootic plague area has a serious potential for human infection since the relatively more susceptible rat can serve as a direct avenue of infection to man. Such a situation was noted many years ago in southern California where the flea, Diamanus montanus, transferred the infection from ground squirrels to rats (18). In the San Francisco Bay region Norway rats have been found dead from plague in situations where the infection transferred from vole and deer mouse populations undergoing an epizootic of infection. (19, 20).

. . . The flea is the vector that is considered basic for the perpetuation of P. pestis in nature. . . . . . . .it has been found that species of fleas show wide differences in their efficiency as vectors and that, within a species, individual fleas differ in their capacity to transmit P. pestis. Comprehensive summaries of flea species that have been implicated in plague throughout the world are available in the literature. (21, 22).

. . . the threat is currently a potential one as long as rats and rat fleas are adequately controlled and kept from commingling with wild rodents on a large scale in areas of enzootic plague. . . .

Abstract (continued)

. . .fleas may act as reservoirs of P. pestis as well as vectors. . . . certain species of fleas can maintain P. pestis during the interepizootic period or through the rigors of the winter season.

. . . the introduction of a stress situation . . . may allow the resistance of the rodents to drop and thus initiate the production of overt disease.. . .

The rodent-flea-rodent chain of infection thought to be the principal pathway in the transmission of plague in nature leaves unexplained many facets of the epizootiologic picture. For instance, an infected area may go through an extended "quiescent period" - during which no evidence of the disease can be found - and then show a resurgence of infections. Attempts to explain these quiescent periods have suggested the flea as a long-term reservoir, or required the reintroduction of the infection from an outside source, but these explanations have not always been compatible with particular situations.

In 1965 an epidemic of plague occurred among Navajo Indians in the vicinity of Gallup, New Mexico . . .

The 1965 epidemic was the largest recorded in the United States in which each human case was associated with a separate infective source in wild rodents. . . .

House dogs or sheep dogs also were noted to be a possible factor. Rabbits and prairie dogs make up a portion of their diet and it has been noted that they will occasionally bring these mammals back to the home area. It is known that dogs have been associated with human plague cases and these Indian dogs have been shown to have significant P. pestis hemagglutination titers. Thus dogs on the Navajo reservation may possibly act as a bridge for infected mammals and/or their fleas.

In the United States from 1908-1965 there have been 111 human infections contracted from wild rodents and other mammals or their fleas, resulting in 64 deaths.

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Disease/Solid Waste Abstracts

No. DSW- 691

Author

Yehia Shaker, Raouf Aziz & Amal Abu El Naga

Title

A Preliminary Study of Infantile Diarrhea in Kuwait

Reference

Amer. J. Publ Health, Vol. 56, No. 9

Doc. No.	Contract No.	Date issued
Sept . 1966, pp. 1580-1587		

Abstract

The infantile diarrheal diseases are an important public health problem throughout the world. . . . These diseases are still the leading cause of death among infants and young children in most of the developing countries.

The combination of high humidity and moderately high temperature seems to increase the incidence of diarrhea, possibly through increasing the breeding of flies and the multiplication of microoorganisms. The peak incidence of flies as illustrated in the fly population curve coincides perfectly with the peak incidence of infantile diarrhea. In mid-summer, i.e., July and August, the combination of minimum humidity and maximum heat seems to be unfavorable for flies and bacteria, hence "summer diarrhea" in Kuwait occurs in autumn!

. . . The peak incidence of associated parenteral infections occurred during the same period of time as the peak incidence of fly population. That there is a relationship between parenteral infections, infantile diarrhea, and fly population is quite evident.

Conclusions

. . . The . . . problem of infantile diarrhea in Kuwait will require for its control coordinated efforts of pediatricians, health authorities, and the community sanitation authorities.

Further accurate studies . . . will have to be carried out. . . .

Health authorities . . . should shift their emphasis from the curative to the preventive aspect. . . .

The public sanitary faciilities should be improved, with particular attention to fly control and sewage disposal.

Descriptors

infantile diarrhea
Kuwait
diarrheal diseases
death
children
statistics
age
sex
feeding
nationality
morbidity and mortality
therapy
prevention
malnutrition
climate
humidity
temperature
flies
sanitary facilities
fly control
sewage disposal
Proteus morgani
Salmonella newport

Abstract (continued)

Summary

Nine hundred and forty inpatient cases of diarrhea in infants aged four weeks to two years were analyzed.

The incidence and case fatality rate were found to be high.

The peak incidence was noticed to have occurred in autumn. The relationship between climate and fly population with infantile diarrhea was demonstrated.

The effect of malnutrition on the morbidity, case severity, and fatality was striking.

The two organisms discovered most frequently were Proteus morgani and Salmonella newport.

Disease/Solid Waste Abstracts

No. DSW- 692

Author

Title

Alarm Sounded Plague Increase

Triggered by Rats

Reference

Geneva (AP) L. A. Times,

Doc. No.	**Contract No.**	**Date issued**
		10-27-66

Abstract

Rats are on the march again and bringing with them the growing menace of a new outbreak of the plague.

This ws was the grim warning delivered by the U.N. World Health Organization as scientists from 16 nations gathered to discuss the next step in the war between man and rodent.

The alarm was sounded after a sharp increase in the number of plague victims this year. Already the total of cases is 3,293 with 211 deaths compared with 1,326 cases and 120 deaths during the whole of 1965.

According to some estimates the rodent population of India alone has increased from 800 million in 1919 to 4.8 billion last year.

Plague Increase Viet Nam has suffered the most plague cases thus far this year with 306 cases and 22 deaths. Plague is also suspected as the cause of an additional 2,158 illnesses and 107 deaths. Number of cases does not include North Viet Nam or areas controlled by communist Viet Cong guerrillas.

The organization warned that the situation has become grave because of rapid urbanization and public indifference. Scientists are fighting to prevent a mingling of wild rodents in the countryside with "domestic" rats and mice which invade homes, shops and warehouses.

Losing Battle But often it is a losing battle as big cities continue to sprawl out into the countryside -- and into the territory of the wild rat. Parasites carried by rodents, including ordinary house mice, can pass on to humans such diseases as

Descriptors

rats
India
wild rodents
developed countries

plague
Viet Nam
mice

deaths
urbanization
developing nations

Abstract (continued)

bacterial food poisoning, dysentery and diarrhea. But the threat is not confined to developing nations alone; many developed countries have large reservoirs of wild rodents -- for example an area in the United States that extends from California as far east as Oklahoma.

Scientists see the key to the problem as lowered reproduction rates among the rodents--poisoning defeats its own aims as it leaves the same amount of food for a smaller number of rats which naturally reproduce quickly.

A big increase in storage security to prevent the rodents from gaining access to warehouses and storage sheds would increase competition for food. Schientists say aggression itself causes hormonal changes resulting in greater susceptibility to infection -- and therefore more chance of death.

The changes may also affect the reproductive mechanisms of both male and female rats and bring about a sharp decline in their birth rate.

Disease/Solid Waste Abstracts

No. DSW-693

Author

Title

National Conference on Salmonellosis,

Atlanta, Georgia, 11-13 March 1964

Reference

U.S. Dept. of Health, Education & Welfare
Public Health Service

Doc. No.	Contract No.	Date issued
PHS Publication No. 1262		1964

Abstract

These proceedings cover the following major topics in regard to salmonellosis:

Delineation of the problem
Population at Risk
Sources of Salmonellosis
Interstate outbreak of S. darby gastro-enteritis
Control of the Salmonella Problem

Descriptors

disease
Salmonellosis
epidemiology
outbreaks
hospital
surveillance
population
infection chain
animal
feed
poultry
eggs
food
field studies
meat industry
poultry industry
egg industry
animal feed industry
Food & Drug Administration
Dept. of Agriculture
environmental engineering
domestic animals
pets
seafood
food packaging

Disease/Solid Waste
Abstracts

No. DSW-694

Author

N.J. Richardson and V. Bokkenheuser

Title

Salmonellae and Shigellae in a Group of Periurban South African Bantu school children

Reference

Journal of Hygiene, Cambridge

Doc. No.	**Contract No.**	**Date issued**
Vol. 61 No. 2	pp. 257-263	1963

Abstract

Summary

1. Faeces from apparently healthy Bantu school children of a periurban district of Johannesburg were examined eight times at regular intervals over a period of 1 year.

2. Of 75 children, 29.3% experienced at least one salmonella infection and 2.7% one shigella infection. It is suggested that over a year nearly all children will have one, and many of them several, infections with these pathogens. The infections occurred at a low rate throughout the year.

3. In most cases the infections were asymptomatic. A few of the children showed evidence of being salmonella carriers of long standing.

4. Eighteen different salmonella types were recovered. Salmonella typhi, S. paratyphi B and S. paratyphi C were absent. The organisms were highly resistant to penicillin, erythromycin and novobiocin and a few strains were also resistant to chloramphenicol and tetracycline.

5. The drinking water was of poor quality and may well be implicated in the transmission of the infections.

Descriptors

salmonella infections
gastro-intestinal disorders
shigella infections
disease
children
periurban area
faeces
carriers
Salmonella typhi
S. paratyphi B
S. paratyphi C
water

Disease/Solid Waste Abstracts

No. DSW-695

Author

R. W. S. Harvey and W. Powell Phillips

Title

An Environmental Survey of Bakehouses and Abattoirs for Salmonellae

Reference

Journal of Hygiene, Cambridge

Doc. No.	**Contract No.**	**Date issued**
Vol. 59	pp. 93-103	1961

Abstract

. . . Salmonellae are commonly found in animals, and all unsterilized animal products are likely to be contaminated with these organisms from time to time.

The surveys reported here were begun after an extensive outbreak of paratyphoid B fever, associated with bakers' confectionery in South Wales, . . .

Summary

2. A large bakery was demonstrated to be regularly contaminated with salmonellae. Thirty-one floor gully swabs out of 111 (27.9%) were positive for salmonellae. Little spread of infection to the general public was experienced.
3. Staff infection with salmonellae was shown to occur in this bakery. . . .
4. It is not though that regular examination of staff excreta would be a profitable means of discovering carriers or of preventing contamination of the products. The frequency with which such examinations would have to be performed to discover short-term excreters would be administratively impossible.
5. Of 274 swabs from gullies in abattoirs, 111 were positive for salmonellae (40.5%). Twenty-one different serotypes were isolated. Seventeen of these serotypes are known to occur in animal feedingstuffs.
6. . . . The phage-types of S. typhimurium isolated from the slaughter houses not infrequently corresponded in timing with the strains isolated from human infections.

Descriptors

salmonella infection
bakehouses
paratyphoid fever
bakers'
Salmonella paratyphi B
food poisoning
excreta
abattoirs
serotypes
animal feedingstuffs
human infectious
phage-types
S. typhimurium

Disease/Solid Waste
Abstracts

No. DSW-696

Author

H. William Smith

Title The Isolation of Salmonellae From the Mesenteric Lymph Nodes & Faeces of Pigs, Cattle, Sheep, Dogs and Cats and From Other Organs of Poultry

Reference

Journal of Hygiene Cambridge

Doc. No.	**Contract No.**	**Date issued**
Vol. 57	pp. 266-273	1959

Abstract

It is known that surface contamination with salmonellae occurs during slaughtering (McDonagh & Smigh, 1958) and that the retention ofpigs for long periods in lairages before slaughter results in cross-infection with salmonellae (Galton, Smith, McElrath & Hardy, 1954; McDonagh & Smith, 1958). It is unlikely that these two facts accounted for the high isolation rate obtained in the present survey because the pigs were killed soon after they were brought to the abattoir, usually within a few hours, and, before culture, their lymph nodes were subjected to procedures known to kill salmonellae present on their surfaces. It is probable, therefore, that the high figure obtained is a reasonably accurate reflexion of the infection rate in pigs in the area studied. Supporting evidence for this was obtained from the survey on pigs brought to the laboratory, all of which originated from different farms.

From the public health point of view, it is significant that the serotypes found in the mesenteric lymph nodes of animals are those commonly associated with outbreaks of food poisoning in human beings. . . . The presence of salmonellae in the intestinal contents . . . is undoubtedly of considerable importance because it is probably this material that accounts for contamination of carcases occurring in the slaughterhouse procedures. The results of the present survey indicate that salmonellae may be isolated more commonly from the mesenteric lymph nodes than from the faeces. Whether this is an expression of the technical difficulties associated with faecal culture and whether salmonellae may occur only intermittently in the faeces of animals with infected mesenteric lymph nodes is not known.

There appears to be a definite relationship between the serotypes of salmonellae found in the mesenteric lymph nodes of the pigs and those found in fish meal, meat

Descriptors

serotypes
mesenteric lymph nodes
food poisoning
slaughterhouse
faeces
fish meal
meat and bone meal
disease
pigs
cattle
sheep
dogs
cats
chickens
Salm. typhi-murium
Salm. anatum
Salm. cholerae-suis
public health
feedingstuffs
disease
salmonellae
pigs
abattoir

Abstract (continued)

meat and bone meal and other protein supplements used in animal feeding in this country (Walker, 1957; Report, 1959). . . .

Summary

1. The mesenteric lymph nodes and faeces of pigs, cattle, sheep, dogs and cats and the intestinal wall and other organs of chickens in Essex, England, have been examined for salmonellae. These animals were either healthy or were not suffering from clinical salmonella infection.

2. Salmonellae were isolated from the mesenteric lymph nodes of sixty (12%) of 500 pigs, nine (4.5%) of 200 dogs, five (2.5%) of 200 cats and none of 200 cattle and 100 sheep. None was found in the chickens.

3. One (0.5%) of the cats and one (0.5%) of thedogs and six (1.2%) of an additional 500 healthy pigs were excreting salmonellae in their faeces.

4. Of the seventeen serotypes found in pigs, Salm. typhi-murium, Salm. anatum and Salm.cholerae-suis occurred most frequently.

5. All strains of Salm. cholerae-suis were isolated in brilliant greem MacConkey broth; selenite broth was unsuitable for this purpose.

6. Despite the high isolation rate from pigs, clinical salmonella infection was diagnosed relatively infrequently at this laboratory. Salm. cholerae-suis was isolated from only one of seventeen epidemiologically unrelated cases of necrotic enteritis in pigs.

7. The results are discussed from the public health and agricultural view points with particular regard to the part infected feedingstuffs may play in causing salmonella infection in animals.

Disease/Solid Waste
Abstracts

No. DSW-697

Author

Dorothy M. Horstmann

Title

Epidemiology of Poliomyelitis and Allied Diseases - 1963

Reference

Yale Journal Biol. Med.

Doc. No.	**Contract No.**	**Date issued**
Vol. 36, pp 5-26		Aug.,1963

Abstract

. . . the use of effective vaccines for prevention and for greatly reducing circulation of wild strains of the virus, have apparently had a real impact on the epidemiological behavior of the disease . . . poliomyelitis-like illnesses. . . . are assuming increased significance, for as the rates of true paralytic poliomyelitis decline . . . .

. . . I shall review briefly our current knowledge of the epidemiology of poliomyelitis as a model for enteroviruses in general . . . .

. . . endemic poliomyelitis is world wide in distribution . . . . The age group attacked in endemic poliomyelitis and in early epidemics is the youngest - 0.4 years, with 90 per cent of paralytic cases (particularly in urban areas) being under 5 years of age. Once this pattern of epidemicity begins, it is apparently irreversible unless preventive vaccination is carried out. . . .

The evidence clearly indicates that poliomyelitis is a highly contagious infection spread by human association. . . . . . . the main source of infection is not the frank case (paralytic or nonparalytic), but rather the mild or completely inapparent infection. . . . Thus in epidemics it has been estimated that only 1-2 per cent of infections are manifested by clinical signs diagnostic of poliomyelitis. . . . majority, 90-95 per cent of infections, are completely inapparent. . . . . no matter which form the infection takes, the presence of virus in blood, throat, and feces is similar, as is the duration of fecal excretion. . . . .

. . . the exact manner in which polio-viruses are transmitted from one person to another is imperfectly understood. Close association, however, such as exists in the family setting, is important in giving rise to contact infections.[6] The oropharynx has been established as the portal of entry and infection is readily induced wi

Descriptors

age group
cockroaches
Coxsackie
disease
ECHO
enteric infection
enteroviruses
epidemics
epidemiology
excreta
extrahuman sources
feces
flies
infection
paralytic cases
pathogenicity
poliomyelitis
sanitation
seasonal pattern
sewage
vaccination
vaccines
virus

Abstract (continued)

vaccine strains by either ingestion or swabbing of the throat. The main portal of exit is the intestinal tract, and large quantities of virus can be found in the feces often for many weeks and occasionally for many months. . . . Whether virus travels from the pharynx of one person to the oropharynx of another, or whether the fecal-oropharyngeal circuit is the major one, has not yet been firmly established. . . . . . . although the evidence is not conclusive one way or another, there is perhaps more data to support the view that poliomyelitis is an enteric infection spread primarily by contaminated excreta. Thus a poor sanitary environment is conducive to its dissemination, a feature which does not have a parallel in infections spread by the respiratory route (7). It is evident also that the period of infectiousness of poliomyelitis parallels closely the period of maximum fecal excretion of virus, when titers of 10^4 to 10^6 tissue culture infective doses (TCD_{50}) per gram of stool are usual. Gard has pointed out that the reduced capacity of the child over two years of age to infect his contacts coincides with the age at which toilet training normally occurs.(8) . . . Taking all the evidence together, the fecal-oral route seems the more important one, although direct pharyngeal-oral pharyngeal spread may also play a role, particularly in epidemic situations.

Extrahuman sources of poliovirus spread. . . . have never been regarded as being of particular importance. Although many animal and arthropod hosts collected in nature have been tested over the years, only flies and cockroaches have yielded polioviruses (1, 16). . . . . . the role of flies in dissemination of polioviruses has not yet been clarified. . . . It is obvious however that flies are not essential to dissemination of polioviruses, since epidemics have occurred in arctic areas under climactic conditions which preclude the presence of these insects.

The extent to which flies may be contaminated in nature with various enteroviruses has been documented recently in connection with oral vaccine trials in Arizona (18, 19) and in Costa Rica (20). . . . . the isolation of polioviruses from vaccinees and from flies in Costa Rica during the same pre- and post-vaccinal periods. . . . The interpretation of the findings is difficult, however, and at this stage we are still unable to fit together the data in a satisfactory manner or to assess the importance of flies in the over-all epidemiological picture.

. . . when the infant mortality falls to a level of 70-80/100,000, epidemics of poliomyelitis are likely to make their appearance. This is not a direct relationship but it would seem that infant mortality is a rough measure of hygienic standards, and the decrease in rate is a reflection of improved sanitation. With this improvement comes decreased circulation of enteric agents, including polioviruses, fewer immunizing infections in the early months of life, and consequently a build-up of susceptibles among whom an epidemic may start should a virulent strain of poliovirus begin spreading. . . .

. . . Why epidemics of enterovirus infection and disease have such a striking seasonal pattern remains unexplained. The agents are present the year round, and circulate silently to some extent in the coldest as well as the warmest season. Still, some as yet mysterious concatenation of circumstances (probably involving the virus, the host, and the environment) seems necessary to bring them out in the open, as it were.

Abstract (continued)

Another major question involving the entire enterovirus family concerns the possible effects of mass oral vaccination on the ecology of these agents. If an entire population has been immunized and offers a relatively solid block of resistance to the spread of wild polioviruses, what effect, if any, will this have on the circulation and the disease producing potentials of other enteroviruses?

The virtual obliteration of the ususal enteric viral flora following massive application of oral vaccine has also been observed by Sabin in Toluca, Mexico, where trivalent vaccine was given to a population heavily seeded with enteroviruses. (37) . . . the polioviruses became dominant in the weeks following vaccine administration, but after three months they were replaced by other agents and poliovirus circulation almost ceased. . . .

. . . Dalldorf (35), while emphasizing the unpredictability of ecological changes generally, has considered the possibility that a decrease in poliovirus circulation may encourage viruses like the Coxsackie B's to become more pathogenic. There is both experimental and field evidence of antagonism between these two groups of agents; . . .

. . . Voroshilova (31) has suggested that an evolutionary gradient of neurovirulence is apparent in the enterovirus family, with poliovirus type I representing the extreme in severity, followed by the other poliovirus types, the Coxsackie B and A7 viruses, down through various ECHO types to those of lowest pathogenicity. . . . . . Gard believes (22) no striking change will occur. . . . Furthermore, since there are so many different types of enteroviruses, the disappearance of one member - viz. poliovirus - would hardly be expected to have a noticeable effect on the rest. Their very number is probably an indication of infinite capacity for mutation, and new types with new potentialities may well arise in the future as in the past.

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Disease/Solid Waste
Abstracts

No. DSW-698

Author Report of a WHO Expert Committee on Helminthiases

Title

Soil-Transmitted Helminths

Reference WORLD HEALTH ORGANIZATION
TECHNICAL REPORT SERIES

Doc. No.	Contract No.	Date issued
277		1964

Abstract

It is a safe assumption that parasitic worms are adversely affecting the health status of human populations in essentially all parts of the world. Even in the most highly developed countries, where worm infections are relatively mild or few in number, the ones occurring will be rightly regarded as harmful.

. . . In assessing the relative importance of helminths and the desirability of special programmes to control them, the factors of chief interest are those which affect transmission.

Classified according to the modes of transmission, helminths mostly fall into one of the following five groups: (a) contagious or faecal-borne - eggs or larvae are infective when passed or when deposited at the anus (e.g., Enterobius), therefore infection is transmissible directly from person to person; (b) soil-transmitted (geohelminths) - eggos or larvae become infective after a period of incubation in soil; (c) arthropod-transmitted - infective stages develop in arthropod intermediate hosts which transmit the infection when biting or when ingested by human beings; (d) snail-transmitted - infective stages develop in snail intermediate hosts or in second intermediate hosts after partial development in the snail; (e) food-animal-transmitted - infective stages develop in animals whose flesh is an important item of food for man.

Classified in this manner, helminthic infections as a whole can be viewed as providing, by their prevalence, an index of a community's progress towards a desirable level of sanitation. Successful management of pollution problems will eliminate essentially all of the helminths except those of the arthropod-transmitted group, and the elimination of mosquitos and other arthropod pests will of course control the arthropod-transmitted helminths as well.

. . . in many . . . areas . . . the most prevalent and most damaging helminths are those of the soil-transmitted group.

Descriptors

Helminths

Abstract (continued)

From the standpoint of their over-all prevalence and the severity of the diseases caused by them, the most important soil-transmitted helminths are: *Ascaris lumbricoides* Linnaeus, 1758; *Trichuris trichiura* (Linnaeus, 1771) Stiles, 1901; *Necator americanus* (Stiles, 1902) Stiles 1903; and *Ancylostoma duodenale* (Dubini, 1843) Creplin, 1945. An additional species, less widely distributed and less restricted to soil-transmission, is *Strongyloides stercoralis* (Bavay, 1877) Stiles and Hassall, 1902.

. . . The pig *Ascaris* is known to be highly prevalent throughout the world, but, although it is known to develop in man, its importance as a cause of human disease is undetermined. . . . The *Trichuris* of pigs and lower primates, possibly the same species as occurs in man, and the *Trichuris* (*T. vulpis* Froelich, 1789) of dogs are believed to be transmissible to man, but neither their prevalence and distribution nor their pathogenicity to man have been adequately assessed. *Capillaria hepatica* (Bancroft, 1893) Travassos, 1915, a common helminth of rats and transmissible through soil to man, may also be important in some areas. Likewise *Ancylostoma ceylanicum* Looss, 1911, *A. braziliense* de Faria, 1910, *Ternidens* and *Trichostrongylus* species, and perhaps others may be important in particular localities.

In summary, the helminths that, as a group, have the widest and most general distribution and the highest prevalence rates are those whoe infective stages are generated in soil; in a large part of the world they also cause the highest incidence of human diseases.

. . . There is considerable difference of opinion regarding the advisability of using sewage products for agricultural purposes. It has been shown that even dried, digested sludge from some sewage plants contains viable *Ascaris* eggs.

On the other hand, it has been repeatedly reported that the agricultural use of well-dried sludge or the effluent from modern sewage works is not a factor in the transmission of helminths. . . .

The relationship between pollution of water supplies and transmission of these parasites has been shown . . . .

Disease/Solid Waste
Abstracts

No. **DSW-** 699

Author

W.H.O. EXPERT COMMITTEE ON HEPATITIS (2nd Repor

Title

Epidemiology of Viral Hepatitis

Reference

W.H.O. Technical Report Series

Doc. No.	**Contract No.**	**Date issued**
No. 285, pp. 8-21		1964

Abstract

Faecal filtrates from infectious hepatitis patients have been shown to transmit the disease when administered to volunteers by the oral route. . . . In studies of experimentally infected subjects viraemia and faecal excretion of the agent have been demonstrated during the pre-icteric stage and have ceased by about three weeks after onset of jaundice. . . .

In one series of experimental transmission studies with a virus having an average incubation period of 40 days, the agent was demonstrated to be in the faeces of icteric patients from about 16 days before until between one and eight days after the onset of jaundice. Individuals with anicteric infections are believed to excrete the virus for a comparable period of time. . . .

Available data indicate that most cases of infectious hepatitis are due to person-to-person transmission, the effectiveness of which appears to be related to the closeness of contact. Persons living in the same household as a patient are at the greatest risk. . . . In most studies the lower soci-economic groups have a higher prevalence of infectious hepatitis in childhood, presumably as a result of greater crowding, poorer sanitation and less adequate personal hygiene.

The recognition of water- and food-borne epidemcis of hepatitis has resulted in an increased awareness of the potential importance of this mode of spread. . . .

Mechanical transfer of the virus from faeces to food or eating-untensils by flies and cockroaches has been suggested, but there is no evidence that this mode of transmission has any significance.

The general measures to be taken to limit the spread of infection from recognized patients and contacts are those usually applied when other enteric infections occur; personal cleanliness and the safe disposal of faeces and urine of patients and contacts. . . .

Descriptors

Hepatitis
epidemiology
viral hepatitis
infectious hepatitis
faecal filtrates
disease
faecal excretion
environmental factors
transmission
contact
socio-economic groups
hygiene
sanitation
water-food-borne epidemics
water supply
milk
shellfish
clams
oysters
foods
mechanical transfer
flies
cockroaches
host factors
etiology
disposal of faeces
contamination
sewage

Abstract (continued)

. . . Contamination of food, water and milk directly or indirectly by contacts or patients or by sewage should be prevented.

Disease/Solid Waste Abstracts

No. DSW- 700

Author

A. I. G. McLaughlin

Title

The Dust Diseases in Great Britain

Reference

A.M.A. Archives of Industrial Health

Doc. No.	**Contract No.**	**Date issued**
V. 12:83-98		1955

Abstract

Silicosis has been found to be a cause of disability in the following broad groups of industries as well as in coal mining and other forms of mining, such as tin, hematite, copper, barites, and fire clay: 1. Refractories industry; 2. Pottery industry; 3. Stone quarrying, crushing and dressing; 4. Metal grinding; 5. Sandblasting; 6. Manufacture of abrasive soap; 7. Foundry industry.

Classical silicosis usually occurs after the worker has been exposed to dust containing a high proportion of free silica. It is becoming increasingly clear, in our opinion, that even small proportions of free silica in a dust can cause a fibrosis which is composed of nodules not of the classical type. Harding, Gloyne, and I have applied the term mixed dust pneumoconiosis, or mixed dust fibrosis, to this nodule. It has been found in foundry workers, especially in cleaners of iron castings, in persons exposed to the dust of graphite containing about 10% free silica, and in boiler scalers who are exposed to a mixed dust with a low proportion of SiO_2. Coal contains varying proportions of free silica.

Boiler Scalers' Pneumoconiosis--These men are exposed to a mixed dust which varies according to the type of fuel used to heat the boilers and the water used in them. It contains carbonates, silicates, iron, and carbon. The dust from oil-fired boilers causes symptoms of bronchospasm or asthma in a high proportion of cases, and it is likely that this is due to the presence of vanadium in the oil soot.

Talc Pneumoconiosis--It is clear that talc dust, though fibrogenic, is not so active as asbestos in damaging the lungs.

Leather Dressers' Pneumoconiosis--The workers at one leather factory showed abnormal x-ray changes, whereas in other departments, where there was no dust, no abnormalities were seen. In the department with the high proportion of x-ray

Descriptors

silicosis
coal mining
mining
tin
hematite
copper
barites
fire clay
refractories industry
pottery industry
stone quarrying, crushing and dressing
metal grinding
sandblasting
manufacture of abrasive soap

foundry industry
classical silicosis
free silica
fibrosis
nodules
mixed dust pneumoconiosis
mixed dust fibrosis
iron castings
coal
boiler scalers' pneumoconiosis
asbestos
leather dressers' pneumoconiosis
hazardous

fuel
carbonates
silicates
iron
carbon
oil-fired boilers
bronchospasm
asthma
vanadium
talc pneumoconiosis
fibrogenic
beryllium pneumonitis

(See Page 2)

Abstract (continued)

abnormalities, skins loaded with china clay and calcium carbonate are dressed on rapidly revolving felt wheels covered with a layer of fine Carborundum powder. The job is very dusty, though it is done under exhaust ventilation. The dust is composed of much fine leather dust, with smaller proportions of china clay (kaolin), calcium carbonate, and Carborundum. It was found that the dust contained about 5% of free silica.

Even apart from china clay, the presence of a small proportion of free silica is prima facie evidence that the dressing of such skins is a hazardous occupation.

Beryllium Pneumonitis and Granulomatosis--Many workers have been exposed to the dust of fluorescent lamp powders containing beryllium oxide and also the dust and fumes from the alloys. It is undeniable that beryllium oxide is toxid. The ingredients of the lamp powder is silica gel (25%).

"Pneumoconiosis" from Vegetable Dusts--The ilnesses noted among cotton workers include mill fever, a transitory illness which affects nearly all new workers in cotton, flax, and hemp mills and also in malt houses; "Monday fever;" weavers' cough; and byssinosis.

Byssinosis develops after about 20 years as a natural progression from "Monday fever" and in its final stage has the characteristics of chronic bronchitis and emphysema. The workers in the cotton card and blowing rooms suffer most from the disease. Strippers and grinders who clean the carding engines are especially affected.

Bagassosis--Only one factory in the country handles bagasse (or sugar cane without the sugar), and bagassosis has occurred mainly in those workers who were grinding bagasse in a dry state. The condition is an acute bronchiolitis, with high temperature, sever dyspnea.

Farmers Lung--It occurs mainly among workers who have been handling moldy hay during a wet summer, it is regarded as being caused by a fungus.

Pneumoconiosis in Grain Dockers--Analysis of the dusts from various grains showed small percentages of free silica; oat dust had 5%.

Graphite Pneumoconiosis--Workers exposed to the dust of natural graphite develop radiographic changes in the lungs and disability. Natural graphite contains small percentages (of the order of 5%-10%) of free silica.

Manganese Pneumonitis--A few cases of manganese poisoning affecting the nervous system occurred in workers grinding manganese dioxide for use in lamp batteries.

Vanadium Pneumonitis--Workers exposed to vanadium pentoxide dust. The effects are a combination of systemic poisoning and irritation of the pulmonary tissue, leading in some cases to bronchospasm and pneumonia.

Descriptors - Continued from Page One

vanadium pentoxide dust
granulomatosis
fluorescent lamp powders
fumes
alloys
toxic
silica gel
pneumoconiosis from vegetable dusts
pneumoconiosis in grain dockers
natural graphite
"Monday fever"
emphysema
weavers cough
byssinosis
chronic bronchitis
cotton card
lungs
blowing rooms
disease
strippers
grinders
bagassosis
bagasse
dry state
manganese dioxide
pneumonia
vanadium pneumonitis
acute bronchitis
dyspnea
farmers lung
moldy hay
fungus
oat dust
graphite pneumoconiosis
manganese pneumonitis
manganese poisoning

**Disease/Solid Waste
Abstracts**

No. DSW- 701

Author
Frederick J. Vintinner and
Anna M. Baetjer

Title

Effect of Bituminous Coal Dust and Smoke
On the Lungs--Animal Experiments

Reference

AMA Archives Ind. Hygiene and Occup. Med.

Doc. No.	**Contract No.**	**Date issued**
4:206-16		Sept.1951

Abstract

The effect of atmospheric contaminants, such as dust and smoke, on the susceptibility to respiratory infections is a subject of interest. Some few attempts have been made to determine the effect of dust and smoke on susceptibility to pneumonia, but the results have been contradictory and subject to many limitations. In the series of experiments presented now, the effects of bituminous coal dust and bituminous coal smoke on the resistance of rats to lobar pneumonia were investigated. In addition, some studies were made concerning the pathological effect of these materials on lung tissue.

It has been assumed in general that industrial dusts in the air are a factor predisposing to pneumonia.[2] The evidence offered to support this view is based largely on the mortality rates reported for pneumonia occurring in men engaged in certain dusty occupations. However, the data presented in the previous studies are subject to criticism in view of the conflicting evidence, the lack of reliability of reported occupational mortality rates, and the many other factors involved. Epidemiological studies on the effects of coal dust have yielded conflicting results.

The experimental work which has been done to study the effect of coal-dust exposure on resistance to pneumonia is limited. Schnurer[11] exposed a few rabbits, rats, and mice to the smoke of anthracite, coke, and bituminous coal. She reported that the greatest number of cases of uncomplicated pneumonia and the greatest incidence of bronchitis occurred among the animals exposed to the products of combustion of bituminous coal.

The review of the literature shows that there is little evidence to support or deny the contention that inhalation of coal dust and smoke may predispose to

Descriptors

atmospheric contaminants
dust
smoke
respiratory infections
pneumonia
bituminous coal dust
bituminous coal smoke
rats
lobar pneumonia
lung tissue
industrial
occupational mortality
epidmiological studies
coal miners
respiratory diseases
coal-dust
anthracite
coke
bituminous coal
exposure
experimental methods
composition of bituminous coal
concentration of the dust particles
oxygen
carbon dioxide
carbon monoxide
sulfur dioxide
particulate matter in smoke
gas composition
cities
inhalation
silica
quartz
feldspar
pneumococci
protection

Abstract (continued)

pneumonia. The available data on this subject are conflicting and of limited value; hence, no conclusions can be drawn at the present time concerning the relationship of coal dust and smoke exposure to respiratory infections.

Table 1--Composition of Bituminous Coal

Proximate Analysis as Received		Ultimate Analysis Dry	
Total moisture	3.04%	Carbon	70.73%
Fixed carbon	44.42%	Hydrogen	5.08%
Volatile carbon	41.47%	Sulfur	4.52%
Ash	11.07%	Ash	11.43%
Softening point of ash	2240F	Nitrogen	1.21%
Fusion point of ash	2360F	Oxygen	7.03%
Sesquioxide of iron in ash	31.96%	BTU	12961

The bituminous coal used in the smoke experiments was the same as that used in the smoke experiments was the same as that used in the dust experiments except that it was not pulverized into as small particles as that in the dust experiments.

Concentration of Coal Dust and Smoke in Chambers--The concentration of the bituminous coal dust in the air of the dust exposure chambers varied between 400 and 850 million, with an average of 700 million, dust particles per cubic foot of air. No attempt was made to maintain a uniform concentration of the dust particles in the air, since such conditions rarely, if ever, exist in industry. The gases determined were oxygen, carbon dioxide, carbon monoxide, and sulfur dioxide.

Duration of Coal-Dust or Smoke Exposure--The duration of dust or smoke exposure prior to injection of the Pneumococcus culture varied from five to 165 days for the bituminous-coal-dust experiments and from two to 154 days for the bituminous-coal-smoke experiments. The rats were exposed for 5½ days a week and were not exposed on holidays. However, the actual dust or smoke exposure was calculated on a basis of exposure days, each day representing eight house of exposure. The figures in the tables indicate the number of eight-hour-day exposures.

This investigation showed that inhalation of bituminous coal dust did not increase the rats' susceptibility to lobar pneumonia, produced by intrabronchial injection of Type 1 pneumococci suspended in mucin, but, in fact, increased their resistance. No such protective mechanism was evident when the organisms were given in broth, a procedure which led primarily to a rapidly developing septicemia rather than to lobar consolidation. These results were similar to those obtained in the experiments with silica (quartz) and feldspar dust which were reported previously. It was shown that rats exposed to high concentrations of these dusts presented increased resistance to pneumococci suspended in mucin but not to those in broth.[1a] The mechanism of the action of quartz, feldspar, and coal dust against the mucin conveyed pneumococci is not clear.

Inhalation of smoke produced by the combustion of bituminous coal did not affect appreciably the rats' resistance to the pneumococci whether the organisms were injected in broth or in mucin. There was, in general, a lower mortality in the smoke-exposed rats than in their controls when the organisms were suspended in mucin, but the differences were not statistically significant. These experiments

Abstract (continued)

indicated that the protection afforded by the coal dust was associated only with the presence of coal dust in the lungs. Exposing the rats to coal dust and smoke for over 20 weeks increased somewhat the incidence of spontaneous lung disease as judged by gross inspection of the lungs at autopsy but did not affect the weight of mature rats.

References

[1a] Baetjer, A.M., and Vintinner, F.J.: The Effect of Silica and Feldspar Dusts on Susceptibility to Lobar Pneumonia, J. Indust. Hyg. & Toxicol. 26:4, 1944.

[2] Heffron, R.: Pneumonia, New York, Commonwealth Fund, 1939, pp. 340-342.

[11] Schnurer, L.: Effects of Inhalation of Smoke from Common Fuels, Am. J. Pub. Health 27:1010, 1937.

Abstract (continued)

TABLE 2 - Analysis of Particulate Matter in Smoke in Exposure Chambers

	Chamber 1				Chamber 2			
	Milligrams per 10 Cu.M.of Air				Milligrams per 10 Cu.M. of Air			
	Max.	Min.	Av.	Percentage Compsition (by weight)	Max.	Min.	Av.	Percentage Composition (by weight)
Unfiltered smoke								
Total solids.....	955	230	570	100	345	106	220	100
Carbon..........	765	187	470	82	261	92	166	75
Ash.............	190	43	93	18	84	14	54	25
Silica..........	55	25	46	9	8.6	6.7	8	4
Iron (Fe_2O_3).....	37	1.2	15	3	4.4	0.7	3	2
Sulfur..........	14	4.2	9	2	13.0	5.0	9	4
Filtered smoke								
Total solids.....	262	164	213	100	172	82	130	100
Carbon..........	170	101	134	63	114	55	85	65
Ash.............	92	63	79	37	58	17	45	34
Silica..........	13	11	12	6	9	3	6	4
Iron oxide (Fe_2O_3)........	5	2	4	2	2	8	1	1
Sulfur..........	5	3	4	2	4	2	3	2

TABLE 3 - Average Gas Composition in Exposure Chambers

	Chamber 1		Chamber 2	
	Max.	Min.	Max.	Min.
Oxygen	21.0%	20.2%	20.6%	20.4%
Carbon dioxide....	0.2%	0.0%	1.0%	0.8%
Carbon monoxide......................	30.0 ppm	10.0 ppm	20.0 ppm	5.0 ppm
Sulfur dioxide.......................	1.6 ppm	0.8 ppm	0.8 ppm	0.7 ppm

Abstract (continued)

TABLE 4 - Average Composition of Suspended Dust During the Winter Months for All Cities

	Milligrams per 10 Cu. M. of Air	Percentage Composition (by Weight)
Total solids	5.10	100
Carbon*	3.30	65
Ash	1.80	35
Silica	0.61	12
Iron oxide (Fe_2O_3)	0.11	2
Sulfur	0.73	14

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* By "carbon" is meant the total loss of ignition.

Disease/Solid Waste
Abstracts

No. DSW- 702

Author

J. Marks and G. Nagelschmidt

Title

Study of the Toxicity of Dust with Use of

The In Vitro Dehydrogenase Technique

Reference

AMA Archives Ind. Health

Doc. No.	**Contract No.**	**Date issued**
20:383-9		Nov.1959

Abstract

Particle size affects dust toxicity. The in vitro toxicity of different types of dust may very considerably. The dusts examined have been listed approximately in the order of their toxicity, but a detailed classification would be premature because full account has not been taken of differences in particle size distribution and in the completeness of dispersion of particles. The toxicity of tissue cultures of tridymite and cristobalite was approximately of the same degree and about twice as great as that of quartz and vitreous silica.

The apparent increase in the fibrogenicity of quartz relative to that of vitreous silica in long-term as compared with short-term experiments may be due to the slow removal of a less active surface layer. This supposed leaching effect may be compared with the action of etching agents described below.

The fibrogenic activity of quartz in rats' lungs is considerably increased by etching with sodium hydroxide or hydrofluoric acid, and the increase is lost when the etched quartz is electrodialyzed.

Particle size--Most of the samples of dust examined in the present investigation were in the Stokes diameter range of 0.5μ-2μ. In the size range studied toxicity was not directly related to surface area. Calculation shows that at the toxic dose level (50% depression of dehydrogenase activity) the number of particles per cell was less than unity in several cases and did not exceed 4 in the rest. The number of particles in relation to the number of cells was thus an important factor. The low ratio of the numbers of particles to numbers of cells found with certain of the dusts suggests that a single particle may injure more than one cell.

Variation in particle size affected the toxicity of silicates only to a relatively small extent. For example, the toxic dose for kaolin of Stokes diameter

Descriptors

particle
dust
toxicity
tissue cultures
tridymite
cristobalite
quartz
vitreous silica
fibrogenicity
leaching effect
etching agents
sodium hydroxide
hydroflucric acid
particle size
Stokes diameter
toxic dose level
silicates and slate
asbestos minerals
industrial dust hazard
lungs
rats
acid-washed slate dust
human lung
acid
slate
felspar
muscovite
γ-Al_2O_3
α-Al_2O_3
coal
anthracite
pathogenic
bituminous coal
isolated phagocytic cells
in vitro
in vivo

Abstract (continued)

0.5μ-2μ was 170μg. per culture, and for kaolin of 2.5μ-5μ it was 270μg. per culture.

It was observed that low multiples of the toxic dose of a silica dust could depress the dehydrogenase activity of a culture after only one or two hours' incubation. This rapid toxic action was seen both with untreated silica dusts and with quartz after treatment with soidum hydroxide. Calcium fluoride has been found to be toxic to phagocytic cells in the lungs of rats but only mildly fibrogenic.

Silicates and Slate: There is little evidence that silicates, with the exception of asbestos minerals, are an industrial dust hazard; they also have little or no fibrogenic activity in the lungs of rats. An acid-washed slate dust was isolated from a human lung has proved to be moderately fibrogenic in rat lung in contrast to the very slight activity shown by untreated slate dust not obtained from lung. Preliminary treatment with acid almost doubled the toxicity of alte and felspar dusts but had no effect on kaolin or muscovite.

Alumina: γ-Al_2O_3 was slightly toxic in vitro and α-Al_2O_3 was inert.

Coal: The effect of coal in tissue culture was very slight. Many animal experiments from different laboratories have found pure coals of different rank to be equally inert, with the exception that Ravin and Enjakova[16] found anthracite to be more pathogenic than bituminous coal in the lungs of rabbits.

A considerable degree of correlation has been observed in the present work between the reaction of isolated phagocytic cells to dusts and the tissue reactions known to occur in the intact animal. On the evidence available at present, it appears that any relatively insoluble dust which proves to be moderately toxic in vitro is likely to be capable of inducing fibrosis in vivo.

Disease/Solid Waste
Abstracts

No. DSW- 703

Author

Paul Gross et al

Title

Glass Dust: A Study of Its Biologic Effects

Reference

AMA Arch. Ind. Health

Doc. No.	**Contract No.**	**Date issued**
21:10-23		Jan 1960

Abstract

Efforts have recently been made to clarify the potential pulmonary hazard of two types of glass dust. One of these was dust derived from a mixture of filamentous glass and a plastic. We undertook the present investigation in order (1) to study the pulmonary response to a glass dust composed of very finely divided particles and to a glass dust composed of larger flake-like particles; (2) to document the effects of massive ingestion of ground glass so that some scientific information may be available on this subject, and (3) to study the potential of a glass dust with larger flake-like glass particles to irritate mucous membranes.

The glass dust used in this investigation was prepared from flakes of glass* which were approximately 5μ thick. The glass contained, in addition to SiO_2 the oxides of Al, Ca, Mg, and B as major constitutents. Also present, but in amounts less than 1% and usually more than trace, were the following elements: Na, K, Ti, Fe, and Zr. Fluorine was also present in traces to 0.3%.

This investigation was composed of three parts:

1. Eye irritation study
2. Ingestion study
3. Pulmonary study

It is highly probable that the relatively large flat surface presented by the glass flakes caused them to become oriented parallel to the conjunctival surface due to surface attraction of the conjunctival fluid. This parallel orientation diminished the probability of injury from the sharp edges of the flakes.

The lack of irritating qualities to skin or mucous membranes of the flake-like glass dust particles is probably due to two important properties of this material.

*Fiberglass Flake

Descriptors

pulmonary hazard
glass dust
particles
flake-like particles
ingestion
mucous membranes
SiO_2
oxides
Al
Ca
Mg
B
food

Na
K
Ti
Fe
Zr
Fluorine
glass flakes
conjunctival surface
conjunctival fluid
injury
irritating
benign

skin
mucous membranes
insolubility
biologic inertness
kaolin dust
bronchial
bronchiolar disease
glass wool
endobronchiolar
peribronchiolar
collagen formation

lesions
bronchial epithelial hperplasia
interstitial pneumonitis
interstitial pulmonary fibrosis
calcification
quartz dust
filamentous form
conjunctiva
lungs
gastrointestinal tract
toxic
traumatic effect

Abstract (continued)

The first is the insolubility, and hence, biologic inertness of glass in general. The second is that because of the large, relatively flat surface of these dust flocculi in particular they tend to orient themselves parallel to the surface and to float upon the film of fluid present (on mucous membranes). The sharp edges of the particles thereby are given little opportunity to inflict tissue damage.

Glass dust deposits in lymph nodes are much less abundant than kaolin dust deposits and, similar to the latter, appear to be completely inert. No bronchial or bronchiolar disease attributable to glass dust could be demonstrated.

In the study of dust from glass wool[2] the conclusions are drawn that this particular glass dust caused endobronchiolar and peribronchiolar lesions, a "tendency toward bronchial epithelial hyperplasia," and interstitial pneumonitis. A case in point is the present investigation in which it was found that 4 out 16 guinea pigs exposed to glass dust suffered from a striking, hitherto undescribed interstitial pulmonary fibrosis with calcification. Since, to our knowledge, no such lesion has previously been reported or seen in animals, it would follow that it was the glass dust that caused the pulmonary fibrosis. As previously indicated, interstitial pulmonary fibrosis identical to that in the glass-dust group was also found in animals exposed to kaolin as well as to quartz dust.

It has been inferred that glass dust in filamentous form may be biologically more active than glass dust in the form of, say, spherules because of the mechanical irritation of the sharp points.

A study was made of the biologic effects of glass dust upon the conjunctiva, the gastrointestinal tract, and the lungs of experimental animals. No effect of glass dust and glass flakes was demonstrable upon the conjunctiva. No toxic or traumatic effect was demonstrable upon the gastrointestinal tract. There was only slight depression of the growth rate when rats ingested a diet containing as much ground glass as food. There was no bronchial disease attributable to the dust.

Compared to kaolin, the pulmonary effect of fine glass dust was even more benign, because the stored dust remained alveolar instead of occupying interstitial positions and therefore was more readily mobilized and cleared from the lung.

Coarse glass dust injected into the lungs of rats behaved like inert foreing material and was associated with minimal foreign body reaction without significant collagen formation.

References

[2] Schepers, G.W.H.: The Biological Action of Glass Wool, A.M.A. Arch. Indust. Health 12:280-287, 1955.

Disease/Solid Waste
Abstracts

No. DSW- 704

Author

A. N. Currie

Title

The Role of Arsenic in Carcinogenesis

Reference

British Medical Bulletin

Doc. No.	**Contract No.**	**Date issued**
4:402-405		1947

Abstract

The most important commercial compound of arsenic is the trioxide, also known as white arsenic, arsenious anhydride and arsenious acid. The worker in industry suffers an arsenical risk directly in the isolation of the element, in the manufacture of its compounds, in the processing of these counpounds for industrial use, and indirectly by such side-effects as exposure to fume or dust during the isolation of other substances containing arsenic as a contaminant.

A typical analysis of Schneeberg mine dust gives:

Silicic acid	50.00%
Alumina	14.65%
Ferrous oxide	7.50%
Calcium oxide	12.85%
Cobalt arsenide	0.19%
Nickel cobalt	0.08%

The view is gaining ground that radium and its products, either alone or in conjunction with arsenic, can cause carcinoma of the lung. Post-mortem, the lungs may show the presence of a simple carcinoma, perhaps an occasional lymphosarcoma, carcinoma of the pleura, of the bronchial glands, and sometimes of the ribs, but only rarely. Hyperkeratoses of the palms of the hands occur in the men washing cobalt ores. These are suggestive of the condition of the palms following the internal administration of arsenic in the treatment of skin diseases.

Three cases of cancer of the skin--one of which was complicated by the presence of pulmonary cancer--have been noted among British arsenical insecticide workers during the last 18 years, and there can be little doubt that arsenic is a contributory

Descriptors

arsenic
trioxide
white arsenic
arsenious anhydride
arsenious acid
compounds
silicic acid
alumina
ferrous oxide
calcium oxide
cobalt arsenide
nickel cobalt
radium
carcinoma
lymphosarcoma
carcinoma of the pleura
carcinoma of the bronchial glands
carcinoma of the ribs
hyperkeratoses
cobalt ores
psoriatics
acne
pruritis
pemphigus
dermatitis herpetiformis
anaemias
bronchitis
asthma
neoplasia-indusing
arsenical epithelioma
arsenical intoxication
water supply
drinking wells
nasal septum
Reichenstein cancer
airborne
arsenical carcinogenesis
potassium arsenite
tar-cancer
malignant
protoplasmic irritant
epitheiial proliferation
carcinogenic aromatic hydrocarbons

Abstract (continued)

factor, among farmers, gardeners and nurserymen, who handle arsenical preparations extensively and who may use arsenic-contaminated materials such as soot and fertilizers.

The common industrial cancers are: (i) mulespinners' cancer; (ii) shale cancer; (iii) pitch and tar cancer; (iv) cancer of the urinary bladder. Pitch and tar cancer occur wherever pitch and tar are extensively and continuously handled and affect face and neck, chest, back, arms, legs and scrotum. Cancer of the urinary bladder is noticeably incident among workers handling such substances as benzidene, β-naphthylamine and aniline in the manufacture of intermediate dyes.

These investigators found arsenic not only in the virgin coal, but also in the blood, hair and urine of briquette workers using pitch. They claimed that pitch- and tar-cancer, and industrial cancers, generally were synonymous with arsenical cancer. This theory has been largely rejected by cancer investigators, among the reasons being:

i. that some practically arsenic-free tars can cause cancer in mice.
ii. coal-hewers do not show a higher incidence than the general population.
iii. the keratoses of palms and soles are not typical of pitch- or tar-cancer, or mulespinners' cancer.
iv. dibenzanthracene compounds of carcinogenic potency have been isolated from tar.

Signs of chronic arsenicism which may precede arsenical skin cancer are: (i) hyperpigmentation or melanosis of the skin; (ii) keratoses.

In the collected cases of arsenical skin cancer, over 50% have occurred in psoriatics but a considerable number developed in subjects treated for acne, pruritis, pemphigus, dermatitis herpetiformis, the various anaemias, bronchitis and asthma, where the intermediate preparative condition rendering the tissues liable to subsequent neoplasia-inducing insult was one of keratosis. The high incidence of cancer among psoriatics has led some investigators to the conclusion that psoriatics are predisposed to skin cancer, quite apart from arsenic administered in their treatment. Arsenical epithelioma may occur in skin which has not undergone a keratotic preparation.

In the collected cases of arsenical skin cancer developing after medicinal treatment with arsenic, it has been noted, among over 140 cases, that exposure to arsenic during treatment varied from 6 weeks to more than 30 years, and in the great majority of cases cancer resulted only after the drug had been administered for a very long period—up to 30 years—although there have been some instances where the exposure was of short duration. The average total quantity administered to each patient was of the order of 430 grains (28.7 g.).

Cases of arsenical intoxication in some instances developing cancer, have been described as occurring in Reichenstein (Silesia) and Cordoba in Argentina owing to the relatively high concentration of arsenic in the public water-supply. In Reichenstein, 1.22 mg.% of arsenic was found in one water sample. In Cordoba some of the drinking wells contained 0.45 mg.% arsenic. Some 65 cases of skin cancer have been reported in the latter area, and these presented all the major characteristics of medicinal arsenical cancer.

Abstract (continued)

The Reichenstein cases are not so well authrenticated, but it is interesting to note that, in addition to the classical signs, perforation of the nasal septum was often observed. Reichenstein cancer has largely been conquered by the supersession of crude smelting methods by modern techniques, so that the town, with its new water-supply and freedom from airborne arsenical dust, can no boast that its public water contains only 0.0015 mg. % of arsenic.

Arsenic has also been combined with tar in a group of animal experiments with a view to studying its influence or the course of tar-cancer, but the results do not admit of a clear-cut interpretation, some experimenters indicating that it has a retarding action on tar-cancer growth, others the reverse.

Conclusion--It is difficult to assess the function of arsenic in the production of malignant change. It may act as a chronic protoplasmic irritant directly stimulating epithelial proliferation. On the other hand, because of its profound effect on cell oxidation, it may bring about an intracellular chemical breakdown liberating organic substances which are known to produce cancer experimentally. These substances may act at the site of their evolution or may be transported to distant parts to effect in time malignant change at their ultimate destination. The general development of skin melanin during treatment or exposure is suggestive, since melanins could very easily be the precursors of carcinogenic aromatic hydrocarbons.

Disease/Solid Waste
Abstracts

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No. DSW- 705

Author
H. E. MacMahon and H. G. Olken

Title
Chronic Pulmonary Beryllosis in Workers Using
Fluorescent Powders Containing Beryllium

Reference
American Medical Association Archives
Ind. Hygiene

Doc. No.	Contract No.	Date issued
Vol. 195-214		February 1950

Abstract

Beryllium is an interesting and unusual element.... It exists as a silvery white metal that is considerably lighter in weight than aluminum but it is nearly four times as hard.... Some beryllium compounds have shown exceptionally good fluorescence and, because of this, have been utilized in the manufacture of fluorescent lamps....

For years beryllium and its compounds were considered to be toxicologically innocuous, but today they have been shown, both in practice and in the laboratory, to be exceedingly dangerous substances.

The etiologic and epidemiologic problems of pulmonary beryllosis have not yet been satisfactorily solved, since this particular form of chronic granulomatous pneumonitis has not been successfully reproduced in animals....

Descriptors

Disease/Solid Waste
Abstracts

No. DSW-70[illegible]

Author
A. R. Riddell

Title
Pulmonary Dust Disease

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Reference
Industrial Medicine

Doc. No.	Contract No.	Date issued
Vol. 17	P. 168-170	May 1948

Abstract

...silica dust inhalation, if the quantity of dust inhaled is adequate, may result in lung fibrosis of a special nature. Collagenous nodule formation is characteristic of this process, but its regular deposition may be altered often profoundly by accompanying infectious processes, or by admixture of the dusts of other materials with silica....

Early in 1942 an occupational lung disease, new to this continent was discovered by Dr. C. G. SHAVER, Superintendent of a sanatorium situated near St. Catharines, Ontario. A description of the disease and the circumstances which revealed it has already been published.[2] The details need not be repeated. In the process involving bauxite, aluminum ore is converted to corundum, a hard metal used in the abrasive industry. While the process is in operation, the attendant workmen are exposed to dense fumes from the materials being treated.

The fume is the source of this lung damage. It contains considerable quantities of very finely divided alumina and silica, and small amounts of many other substances....

The inhalation of cadmium or cadmium compounds, either as fume or dust is attended by respiratory damage of a serious nature. In an Ontario episode 15 workmen from two plants were injured in this way in 1935 - two died.

Dust is produced when the metal is being ground or polished. Fumes are evolved during welding operations, or when the metal is subjected to high temperatures by accident, or for the purpose of [illegible] cadmium fume.

It was during the war years that beryllium poisoning was drawn to our attention. Exposure to beryllium or to certain of its compounds is attended in certain individuals by skin troubles. It is also attended by lung disease, often of a serious nature. The disease has special features. Symptoms may develop during exposure or [illegible] may [illegible]

Descriptors

silica dust
lung fibrosis
collagenous nodule
silicosis
tuberculosis
occupational lung disease
bauxite
aluminum ore
industrial operations
corundum
fumes
lung damage
alumina
silica
[illegible]
cadmium compounds
died
[illegible]
beryllium poisoning
skin troubles
asbestos
lung fibrosis
silicates
talc
hydrated magnesium silicate
industry
[illegible]
crystalline
limestone
quartz
dust

Abstract (continued)

delayed, perhaps, for months or years after exposure has ceased....

The dust of asbestos, a fibrous silicate, induces a lung fibrosis which may be disabling....

Aside from asbestos, silicates are not usually related to lung injury. In this respect talc, a hydrated magnesium silicate, may be an exception. Although no clear evidence of injury has been produced in connection with persons handling talc, in many industrial operations such as tire building, paper making, etc., injury has been demonstrated in relation to the production of this substance..

The talc, a fibrous and flaky variety containing a small quantity of tremolite, occurs in formation consisting largely of crystalline limestone. In this formation numerous stringers of quartz are found. In the past, dust conditions in the mills were very bad, and great clouds of dust, visible from a considerable distance, could be seen escaping when crushing was in progress.

Dust sampling was done in these mills....

Certain lung conditions termed benign pneumoconioses, of which siderosis is an example are not infrequently encountered. These conditions are not in the lease disabling and they do not affect life expectancy. They arise in relation to occupations in which dust of metals or other inert materials are produced.

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Disease/Solid Waste
Abstracts

No. DSW-[illegible]

Author
Natalio Bayonet, Rafael Lavergne

Title
Respiratory Disease of Bagasse Workers

A Clinical Analysis of 69 Cases

Reference
Industrial Medicine

Reproduced from best available copy.

Doc. No.	Contract No.	Date issued
Vol. 29	P. 519-[illegible]	November 1960

Abstract

The paper mill of Grace & Company at Arecibo, Puerto Rico, began operating in January, 1959. This plant employs bagasse fiber, the waste product remaining after the extraction of juice from the sugar cane, in the manufacture of commercial paper. The fiber is also used in making corrugated board.

During the "zafra" or sugar cane grinding season which lasts from early January to late May, the paper mill employs fresh bagasse carried by conveyor from the sugar mill to the paper mill, directly into the process of pulping, refining, and paper making. The excess bagasse is collected at the sugar mills, pressed and tied with wire in bundles of about 1-1/2 x 2 x 4 feet, and stored... During this storage period many fungi have grown or developed and the bagasse fiber becomes dry.

The most common symptoms are chest pain, shortness of breath, sore throat, matinal cough with whitish expectoration, rapid loss of weight, anorexia, fatigue, malaise, low grade nocturnal fever, headache, and anxiety, in that order....

...The concentration of dust has no bearing on the appearance of the disease. After precautions at the plant were taken to reduce air pollution, and preventive measures such as protective masks and fine water spray of bales were used, cases continued to appear, although in a smaller number. The people mostly affected were bale breakers and tractor drivers but we have had watchmen and electricians who contracted the disease although they went only occasionally to the bale breaking area and exposure was minimal.

It appears that only the dry bagasse that has been stored in the fields causes the disease.

Descriptors
bagasse fiber
waste
sugar cane
commercial paper
fiber
fresh bagasse
sugar mill
paper mill
pulping
refining
paper making
fungi
dry
bagassosis
chest pain
shortness of breath
sore throat
matinal cough
anorexia
fatigue
malaise
nocturnal fever
headache
anxiety
dyspnea
dust
air pollution
bale breakers
tractor drivers
watchmen
electricians
dry bagasse
disease
kraft paper

Abstract (continued)

The disease appeared among workers of the Grace and Company paper mill at Arecibo, Puerto Rico, which utilizes dry bagasse in the manufacture of kraft paper. It is characterized by chest pain, shortness of breath, sore throat, cough with expectoration, rapid loss of weight, fatigue, low grade fever and other minor symptoms....

Disease/Solid Waste
Abstracts

No. DSW- 708

Author Arthur J. Vorwald, James D. MacEwen,
Ralph G. Smith

Title
Mineral Content of Lung in Certain
Pneumoconioses

Reproduced from
best available copy.

Reference
Archives of Pathology

Doc. No.	Contract No.	Date issued
Vol. 74, pp. 267-274		October 1962

Abstract

The pathogenesis of a pneumoconiosis, viz., the pulmonary condition provoked by an inhaled mineral dust, depends on the operation of several interrelated variables. In general, these have reference not only to the chemical and physical nature of the dust, its concentration in the inhaled air, and its inherent toxicity but also to the individual's duration of exposure, the health status of his respiratory tract and lung, and the character and extent of his pulmonary response.

...Particular attention is invited to the high values for certain common elements, notably aluminum, iron, and zinc....

...In terms of a pneumoconiosis, the pulmonary condition imposed by inhaled oxides of iron is identified as siderosis.[8,9]

...The pulmonary deposition and prolonged retention of free silica in the crystalline state with consequent silicosis still constitutes one of the major fibrogenic pneumoconioses...

...Silica in the free and uncombined state causes silicosis, and the values are considered to be most meaningful when related to the dry pulmonary tissue....

Briefly, the case is that of an adult white male who was employed for 33 years in a rubber industry. During 21 of those years his job included the intermittent use of a dusting powder, presumably pure soapstone. Ultimately, he developed progressive shortness of breath with chest roentgenographic changes consistent with chronic diffuse proliferative disease.... Thus, in final analysis the case was judged to be a fibrogenic pneumoconiosis induced in inhaled mica.

Descriptors

pathogenesis
pneumoconiosis
mineral dust
toxicity
health status
respiratory tract
lung
analytical chemistry
pulmonary metals
aluminum
iron
zinc
oxides of iron
siderosis
silica
silicosis
fibrogenic pneumoconioses
rubber industry
soapstone
mica

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TABLE 1. - Metals in Pulmonary Lung Tissue:
Normal Values, ppm

Element	Wet Tis. Av.	Dry Tissue Av.	Dry Tissue Range	Ash Median
Al	59.4		0-9.90	2,000.00
Ba				14.00
Cr			0-4.90	13.00
Cu	1.10	12.10		120.00
Fe		1,033.00	0-1,490.00	
Pb	0.28	2.34	0-6.90	47.00
Mn	0.22	1.77	0-3.90	16.00
Sn	0.45			32.00
Ti				190.00
Zn		86.30	0-110.00	1,300.00

References 4, 5, 6 and 7

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Disease/Solid Waste
Abstracts

No. DSW- 709

Author

Hunter H. Comly, M.D.

Title

Cyanosis in Infants Caused by Nitrates
In Well Water

Reference

J. Amer. Med. Assoc.

Doc. No.	Contract No.	Date issued
V.129: 112-116		9-8-45

Abstract

Two examples of a previously unrecognized condition which may be confused with congenital heart disease are cited in this report. The condition may occur anywhere in rural areas where well water is used in infant feeding.

Case 1: She was admitted to a local hospital at 18 days of age because of vomiting, excessive crying and failure to gain weight. A defective oil burner was in the home, and although the picture was not consistent with carbon monoxide poisoning a peculiar gaseous poison producing methtemoglobinemia was suspected. Preliminary treatment with oxygen for thirty minutes resulted in no change. Therefore, 1 per cent methylene blue, 1.1 cc. for each kilogram of body weight, was administered under the scalp, and the local area was massaged vigorously. Within thirty minutes the color, respirations and heart rate were normal. The cyanosis did not recur in the hospital, and the baby was discharged in a week, asymptomatic and taking the soy bean formula satisfactorily. Forty-eight hours later the baby again was taken to the hospital with similar signs and the same treatment was employed. Two days later the parents suspected the onset of the same condition and returned with her to the hospital. Much to every one's disappointment, the baby was readmitted the next day suffering the worst attack of any. Two hours were required for the methylene blue treatment to relieve her distress. It was realized that the only significant change in the infant's environment from hospital to farm home was in the water. The father believed that a peculiar reaction occurred between the well water and the soy bean preparation, producing a poison which caused her distress. Hence he asked the admitting physician if it would be desirable to bring samples of the water and

Descriptors

cyanosis
infants
nitrates
well water
methemoglobinemia
nitrite
coliform
excreta
barnyards
privies
leaching

Abstract (continued)

powdered formula to the hospital for analysis. An open minded attitude on the part of the latter in accepting this "cock and bull" theory as plausible resulted in the father's bringing the water, which yielded the answer to the problem. It was thought that the well water might contain toxic amounts of nitrates. An analysis of the water confirmed this suspicion. An unboiled sample of water had a nitrate nitrogen value of 140 parts per million, which is equivalent to 0.619 Gm. of nitrate ion to the liter. The sample contained 0.4 mg. of nitrite ion to the liter. Culture of water from the well revealed the water to be highly polluted, as an M. P. N. (most probably number of coliform organisms for each hundred cubic centimeters) of 240 was obtained. U. S. Public Health Service drinking water standards allow an M.P.N. of not more than 5.

Case 2: The first three samples of blood when draw were of a peculiar chocolate color. One-half hour after the methylene blue was given the blood was normal in color. A sample of the well water used in preparing the infant's formula had a nitrate nitrogen value of 90 parts per million, which is equivalent to 0.388 Gm. of nitrate ion, to the liter. The nitrite ion content was 1,314 mg. to the liter. The well water was tested bacteriologically and found to be as badly polluted as the well in case 1.

Since these patients were seen by us, the Iowa State Hygienic Laboratory has received from similar wells five other samples of water containing large amounts of nitrates. The analyses were made because infants who drank the water were cyanotic. Dr. Morgan J. Foster of Cedar Rapids, Iowa, states that he has seen 5 similar cases in his practice. Dr. Roland Stahr, formerly of Fort Dodge, Iowa, reported 5 cases of idiopathic cyanosis at the annual meeting of the American Academy of Pediatrics in San Francisco during May 1941. Methemoglobinemia was proved to be the source of the cyanosis. It cannot be stated definitely that these babies received well water, but 4 of the patients lived in northern rural Iowa. Members of our staff, after having learned of this condition, saw 2 babies who were cyanotic without obvious cause. Both infants improved when the well water was removed from the feeding. Thus it would seem that this condition is not rare, and a discussion of certain of its aspects may be helpful: It would seem that the methemoglobinemia of the infants of this report was produced as the result of the ingestion of well water containing large amounts of nitrate compounds. The nitrate ion was probably converted to the nitrite ion in the intestine by bacterial action. The nitrite ion, so formed, was absorbed and reacted with hemoglobin to form methemoglobin. The amount of nitrites already present in the well water was probably of little significance.

The high nitrate water which the cyanotic infants ingested came from very undesirable wells. In many cases the wells were old, dug rather than drilled, had inadequate casings or none at all, and were poorly covered so that surface water, animal excreta and other objectionable material could enter freely. In every one of the instances in which cyanosis developed in infants the wells were situated near barnyards and pit privies. Some of the wells had trees growing nearby, and the roots had penetrated or broken down the casings. In four of the five the water was highly contaminated with coliform organisms, but in the fifth case the water was bacteriologically safe for drinking purposes. This point serves to emphasize the fact that a well may be acceptable with respect to bacterial content and yet

Abstract (continued)

be potentially dangerous for use in infant feeding. It is not difficult to visualize how such a situation may arise: water seeping from barnyards and privy pits, heavily laden with bacteria and dissolved nitrogenous materials, becomes increasingly purified by passage through the soil. Certain soil bacteria have the power to oxidize ammonia and other nitrogen compounds to nitrates. The solution of nitrates so formed, rendered free from coliform organisms by the competitive growth of the hardy soil bacteria, may then enter subsurface water channels leading directly into wells used for drinking purposes. In periods of low water table the passage of the water through the earth may be slower. This slow passage may allow more nitrate to be leached from the soil and become concentrated in the wells until toxic amounts are present.

The nitrate content of water taken from wells in Iowa varied from zero to 125 parts per million (as nitrate nitrogen). The nitrate nitrogen of the water given to the infants varied from 64 to 140 parts per million, and the severity of symptoms seemed to parallel roughly the amount of nitrate present. Although no definite statement can be made, it would seem advisable to recommend that well water used in infant feeding possess a nitrate content no higher than 10 or, at the most, 20 parts per million.

From the foregoing discussion it is obvious that artificial feeding of the farm baby is fraught with potential danger, and it serves to emphasize the desirability of breast feeding whenever possible. Certainly, in view of the deplorable condition of most wells, the physician should make inquiry regarding the source of water which the infant will receive.

Disease/Solid Waste
Abstracts

No. DSW- 710

Author S. H. Jenkins, D.G. Keight and Avril Ewins;
S. H. Jenkins and J. S. Cooper

Title The Solubility of Heavy Metal Hydroxides in Water, Sewage and Sewage Sludge--II & III; The Precipitation of Metals by Sewage; The Solubility of Heavy Metals Present in Digested Sewage Sludge

Reference

Int. J. Air Wat. Poll.

Doc. No.	**Contract No.**	**Date issued**
Vol. 8: 679-693; 695-703		1964

Abstract

Abstract--Although heavy metals in solution are discharged into many sewerage systems and the salts of some of these metals are known to inhibit biological activity, the extent to which such inhibition occurs under treatment plant conditions is uncertain. It is mainly the soluble metal ion that causes interference with biological oxidation and if precipitation of the metal occurs then the severity of any inhibition is correspondingly reduced. The extent of precipitation of these metals by sewage does not appear to have been studied in detail, but from the high concentration of copper, nickel, zinc, and chromium in sewage sludge obtained from sewage mixed with the soluble salts of these metals, it is evident that precipitation occurs at some stage in the purification of sewage.

The experiments reported in this paper were carried out in order to determine the precipitation of certain heavy metals by sewage, and the effect of such factors as concentration of metals and pH upon the preciptation.

Abstract--Heavy metals in the industrial waste water which is discharged into a sewerage system become concentrated in the sewage sludge as a result of preciptation. Since digestion of such sludge occurs in the presence of high concentrations of heavy metals, it was inferred that the metals must be present in an insoluble form. The actual solubility of the heavy metals in dried sludge containing a high concentration of metal was determined by percolatingwater through a column of dried sludge and analysing the filtrate. This showed that the concentration of copper never rose above 3 ppm at the beginning of the percolation process and at the end concentration fell to zero. Nickel was extracted more easily; the concentration reached 21 ppm but eventually fell to below 1 ppm. Zinc was also dissolved, the

Descriptors

heavy metals
sewerage systems
metals
copper
nickel
zinc
chromium
sewage sludge
industrial waste water
sludge
solubility
percolating water
pH values
calcium
agricultural use

Abstract (continued)

concentration in the filtrate rising to a maximum of 42 ppm Zn and then falling to zero. Iron was insoluble. When the sewage sludge was mixed with an equal weight of sand the concentration of metal in aqueous extracts fell.

If the proportions of sludge and soil were the same as those present when sewage sludge was used agriculturally the water extracts contained, at the most, only traces of the metals. By percolating a series of buffered citric acid-ammonium citrate solutions through the sludge at pH values ranging from pH 2 to pH 6 it was found that heavy metals were extracted more readily and concentrations in the extracts of over 1000 ppm were obtained. Not more than 5 per cent of the sodium and potassium was extracted under these conditions but up to 50 per cent of the calcium was removed by citric acid solutions.

Disease/Solid Waste Abstracts

No. DSW- 711

Author

A.B. Cherry, A.J. Gabaccia, and H.W. Senn

Title

The Assimilation Behavior of Certain Toxic Organic Compounds in Natural Water

Reference

Sewage and Ind. Wastes

Doc. No.	**Contract No.**	**Date issued**
V. 28: 1137-46		1956

Abstract

The organic chemical industry is constantly producing new products which create new types of pollutants. Since the physical and chemical properties of these pollutants vary widely and often contain substances which are new to nature, the problem of pollution control becomes quite complex. A number of these compounds are known to be toxic, but the information available on others is quite meager. Some are discharged in concentrations well below those considered objectionable when appraised by the normal standards of stream sanitation. Because of the diversity of the organic chemical industry's waste waters, an adequate appraisal of their pollutional significance is often difficult. Realistic judgment of the pollution problem from such plants requires techniques of effluent examination specially devised for this industry. The procedures normally employed in the examination of sewage require modification. Sanitary sewage...can be easily oxidized....The story can be decidedly different with some industrial wastes, many of them containing organic chemicals which are not readily attacked biologically. The difficulty experienced in treating these compounds lies in the fact that because they are so rare in nature, organisms able to utilize these materials as food are not numerous in the soil and natural water. These necessary organisms must be developed if a valid estimation of the pollutional characteristics of a chemical manufacturing plant waste is to be obtained.

The behavior of several complex organic compounds in natural waters is discussed in this paper to provide specific data on certain current stream pollution problems.

The work to date indicates that certain classes of organic chemical compounds,

Descriptors

organic chemical
pollutants
stream sanitation
industrial wastes
organisms
chemical manufacturing
acrylonitrile
acrylamide monomer
oxydipropionitrile

Abstract (continued)

specifically acrylonitrile, acrylamide monomer, and oxydipropionitrile, may be tolerated by nature to a measurable degree and converted by natural forces into simpler and better understood chemical substances.

Disease/Solid Waste
Abstracts

No. DSW- 712

Author

Morris B. Ettinger

Title

Developments in Detection of Trace
Organic Contaminants

Reference

Jrnl. Am. Water Works Assoc.

Doc. No.	**Contract No.**	**Date issued**
V.57,No.4:453-57		Apr.1965

Abstract

The last 20 years have seen a continuous development of techniques for the identification of trace organic contaminants in water. This development has allowed the importance of these contaminants to be appreciated. Without this growth in the efficiency of technique, the profession would be only vaguely aware of the dangers presented by trace organic contaminants. Professional opinion holds that effects of toxicants jointly present may be additive or "potentiating."

In the case of cholinesterase-inhibiting pesticides, the Food and Drug Administration reported [11] that: "Recent experiments show that two cholinesterase-inhibiting pesticides, when fed simultaneously to test animals, are far more toxic than the sum of their toxicities when they are fed separately." Clearly, a toxicant in water cannot be discounted as harmless because its concentration is relatively small, without massive specific evidence in support of that view.

One potential hazard now under scrutiny is the possibility of airborne displacement of toxic pesticides and subsequent rainout.

So far, in discussions of toxicants, those that are commercial poisons have been given the most consideration. Does this mean, then, that only this type of material is of genuine concern? A firm answer to this question is not available. The search for environmental toxicants has been most efficient in seeking the known and in using procedures that, of necessity, have been designed to effectively detect and measure the anticipated. What is not known may be of more consequence than what is. Certainly, scientists must continue to be wary of the unknown chemicals in the

Descriptors

trace organic contaminants
water
phenols
pollution
DDT
orthonitrochlorobenzene
diphenyl ether
pyridine
toxicants
pesticides
apparatus
commercial poisons

Abstract (continued)

millions of pounds of materials that industrial process wastes cast on surface water resources daily. Perhaps the time will come when the waste tossed into a water course will have to be as fully described as the product that is put into a container for sale.

References

[11] Pesticide Chemicals. Federal Register (Dec. 6, 1962).

Disease/Solid Waste
Abstracts

No. DSW- 713

Author

Herman A. Affel, Jr.

Title

System Engineering

Reference

Int. Science and Technology

Doc. No.	**Contract No.**	**Date issued**
35: 18-26		Nov. 1964

Abstract

In Brief: The system engineer tackes problems so broad and complex that most specifications of need arn't obvious at first. He brings order to the problem definition and devises operations to match the functions that add up to a solution. The functions can be fulfilled technologically in many ways, but criteria are set on the importance of each function so intelligent tradeoffs can be made. The synthesizing of alternative methods of implementation leads to trial solutions in attempts to make the system output meet the overall requirement of the problem. A wide variety of analysis techniques help to examine the synthesized solutions. There are no general system theories from which a system engineer can draw for special physical systems. He uses methodology all engineers use, but more analytical reasoning, attacks problems all at once rather than piecemeal but draws on wider experience and a point of view that recognizes functional similarities. He then organizes engineering contributions.--E.H.

Let me now define a system in terms of what the system engineer in the real world develops in practice: a system is a set of operations organized to satisfy a definable user requirement. It uses the word "operations" rather than "things"; therefore it includes not only structures of tangible black boxes, but manual procedures and computer programs--intangible but very real structures. Note that it implies satisfying human users, and it also implies a way of measuring the effectiveness of a system.

It is difficult to believe that massive and efficient irrigation systems of ancient days grew just by chance. They were engineered systems. So system engineering has been going on for thousands of years without formal training of its practitioners, without a formally recognized structural methodology, without axioms or proofs--

Descriptors

system engineering
planning
tradeoffs
game theory
systems analysis
problem definition
criteria
operations research
interface
theory of systems

Abstract (continued)

or even a name.

System engineering holds the key because it is concerned essentially with the devising of operational processes that meet human needs.

Note the word devising, for it eliminates another sematic trap in the confusion between operations research and systems engineering. Operations research--as I see it--is concerned with analyzing the workings of existing systems, or at least systems that have been brought to a stage of design where operations can be modeled, or simulated, and analyzed. The system engineer begins his work long before this stage, and the scene he encounters in the planning phase is far less orderly. There is a complex set of needs with no real order. One of the more important tasks in engineering a system is predicting the consequences of its operations. Once you've built it, things aren't the same any more. A system engineer must deal with the human environment in which a system must operate. The difficulty of doing this successfully is generally no easy task. The planning by the system engineer is further complicated by an extremely wide range of technological solutions from which he must make an optimum choice. The true system design tasks are to work with a set of specifications that aren't obvious. They are less a set of specifications than a set of needs, and rarely are they consistent at first.

Defining the problem: So the system engineer working with his client is responsible for developing a true definition of the problem by asking the right questions. Problem definition comes at the beginning of the system engineering process, when the engineering is least capable of being analytically rigorous. I shall go through the steps of designing an airline reservation system as a system engineer would tackle the problem; and, indeed, as we have done in our system design organization. Defining the problem consists of two steps: establishing the real user requirement of the system and identifying the functions that must be performed by the system and within the system to satisfy this requirement. There is also the interface between the customer and the system to be considered. What kinds of questions does the customer ask and how does he ask them? What functions does the ticket agent perform? Which ones does he perform efficiently, inefficiently? No matter how logically the system engineer may plan, this interface with the system's users may be a stumbling block. The system engineer must draw a reasonably accurate picture of the operating environment not only as it exists now but as it is likely to exist in the future.

The product of his efforts to design something to fit a specific environment will inevitably change that environment. And he must be able to predict from past experience and general knowledge the extent and nature of that change. The best he can hope for is a solution good enough to accommodate this change long enough to be economical. How sophisticated a system can be justified on economic grounds?

Once he's defined the functions that must be performed to satisfy the user requirements, he must set some criteria on the importance of each to provide a rational basis for a series of tradeoffs.

Another crucial series of tradeoffs must be made to assure a satisfactory level of system effectiveness under malfunction conditions. The first decision that must be made is the mode of ailure you want to design into the system--and this applies to any system. Do you want to let the system go down completely or can you afford,

Abstract (continued)

either in terms of economics or the established needs, to limp along on partial operation? Graceful degradation, then, is essentially a plan for retreat, predicated upon the importance criteria that have been set on the system functions. This process of setting criteria on and making tradeoffs between functions provides him with a conceptual structure against which he can measure the overall effectiveness of various system alternatives.

The next two steps in the system design procedure--system synthesis and analysis--are both carried on at two levels and are so closely related that they are hard to separate in practice. Once system criteria have been established and the general scope of the system defined, the system can be synthesized by defining system functions and assigning alternative methods of implementation. This is done at two levels: gross and detailed.

The gross definition and assignment of functions aims at establishing the basic functional units and deciding whether they will be performed by man, machine, or a combination of both.

The synthesis procedure in all systems engineering is much like the trial solution we attempted at the beginning of this airline reservation system example. It consists of searching your engineering experience--or more formally examining the state of likely arts--for a number of possible combinations of likely solutions that probably will satisfy the need given in the problem definition.

And so it goes--from synthesis to analysis--and then back again to check the overall result against problem definition, until finally there is a system design that, hopefully, can be frozen and implemented.

The system point of view: I have used this example of an airline reservation system because it enables me to be specific about the things a system engineer does which distinguish his work from what, say, a business manager does in the execution of his work. Without question, the system engineer knows about more things--technical things--and he's more oriented to insisting upon analytical numbers.

The system engineer looks at the functional parts of a system, at the information or material flow between them, and at the delays that may be encountered in various parts as the system is subjected to various loadings. He looks for bottlenecks, for trouble at the interfaces. He includes in his considerations the psychology as well as the economics, the social sciences as well as the physical sciences, and procedural techniques as well as the diverse technical advances of the age. Most importantly, the system engineer provides a structure, which is as formal as possible, for trying to measure the effectiveness of various possible solutions. Topsy is no longer a satisfactory model when the stakes get large enough.

If there is anything that characterizes the environment in which a system engineer lives and works, it is the multi-faceted nature of a problem that appears to overwhelm when it is first presented. System engineering is usually a team affair to share this load.

Abstract (continued)

Systems theory: There must be a general theory of systems. Indeed, there are many system theorists at work, and the characteristic of their output is generality and abstractness. Conventional mathematics turns out to be woefully inadequate for biological systems because precise definitions of points, or sets, or probability distributions don't deal very effectively with such complex systems.

If there were a system theory, I might have used it by assigning appropriate numbers in the example of the airline reservations system to show you how it works. Nevertheless, if system theory today is not throoughly crystallized, it does contribute a source of concepts and mathematical techniques which may lead to better ways to characterize, classify, and identify systems, the better to express their input-output relationships and determine their states.

The system engineer does not have to be a specialist in depth in all fields. But he does have to know what it is reasonable to do in various fields from which he will draw the various parts of the solution.

A system engineer must be able to express himself in terms that will be understood by diverse groups. He is forced to express problems functionally in terms that are independent of the processes of solution. Nevertheless, he must not be so abstract or so mathematical that the system attributes and their relationships cannot be tied to the real world.

Most system engineers have to anticipate the amortization of the huge investments systems require today. In dealing with the uncertainties of system design, they turn to statistical decision theory as a guide to consistent behavior. Game theory is also related because it deals with the uncertainty of each contestant relative to the plans of another.

Armed with these analysis techniques, a firm and current knowledge of the physical state of the arts, a broad point of view and a penchant for seeing functional similarities, a system engineer is a good engineer--only more so.

Disease/Solid Waste
Abstracts

No. DSW- 714

Author

Title

Water Pollution in Europe

Reference

W.H.O. BULLETIN

Doc. No.	**Contract No.**	**Date issued**
Vol. 14 No. 5-6, 1956, pgs. 950-1005		

Abstract

Definition of Pollution

For the purposes of this report, ground water is said to be polluted when its composition is altered, directly or indirectly, as a result of the activities of man, so that it is less suitable for any or all of the purposes for which it would used in its natural state. . . .

In practice, the changes in composition are generally the appearance of harmful bacteria or other organic matter, including gases, or an increase in the mineral salt content.

The main sources of pollution of ground water are domestic sewage and solubel refuse, industrial effluents and soluble wastes, other liquids accidentally spilled, highly saline water originally trapped in the rocks, and sea water.

In most cases pollution from domestic or industrial sources is due to (a) effluents being disposed of into the ground, or into watercourses, without treatment adequate to the circumstances, (b) sites for disposal being badly selected in relation to the position of aquifers or to the direction of ground water flow, (c) sites for abstraction of water being badly chosen, and (d) wells being badly constructed. Sea water pollution is generally due to overpumping.

The first impression . . . may well have been that there is not a lot of information about the subject of study - namely, the pollution of ground water. . . . but . . . it is desired to emphasize that the information given is all relevant to the risk of pollution of ground water....

The survey clearly reveals the overwhelming importance of ground water for public supply purposes. By far the greater proportion of the people of Europe are supplied, or supply themselves, with water from underground. In some countries the proportion approaches 100%; even in the more densely populated countries it often exceeds 75%. . .

Descriptors

hydrological cycle
movement of water
pollution
ground water
sewage
refuse
industrial effluents
soluble wastes
saline water
sea water
magnesium
bicarbonate
sulfates
solium chloride
nitrates
phosphates
iron
manganese
fluorides
ammonia
hydrogen sulfide
human excreta
agriculture
fertilizers
excreta
farm animals
poison sprays
pest control
sewage organisms
disease
domestic refuse
garbage
organic trade wastes
chemical trade wastes
neutral salts
oil
dilution
dispersion
filtration
time

Abstract (continued)

Although ground water is popularly regarded as being "pure", it will be well understood that this does not refer to its chemical quality except in so far as the word "pure" is interpreted as meaning freedom from contaminants which render it unfit for drinking. Natural ground water is by no means chemically pure. It may contain calcium and magnesium bicarbonate from chalk and limestone, the sulfates of these metals, sodium chloride, plant nutrient materials such as nitrates and phosphates, salts of iron and manganese, fluorides, traces of ammonia, and sometimes hydrogen sulfide. . . .

the use of artificial fertilizers is growing . . . . some of the constituents are undoubtedly washed into the subsoil and hence contaminate ground water . . . .

Organic matter produced on farms may also be a source of pollution. We have in mind particularly the excreta of farm animals. . .

The use of poison sprays for pest control may also result in water pollution.. . .

Contamination of ground water with sewage organisms is perhaps the most dangerous of all, . . .

Domestic refuse (garbage) is often tipped on to the land, and water percolating through it can be very highly polluting. . . .

Organic trade wastes . . . can be highly polluting. . . . There is mention in the report from Switzerland of infiltration of an effluent from a sugar refinery having been found to extend throughout a zone 1 km wide and 4.5 km long.

The wastes from some chemical factories are sometimes discharged into the ground, either by accident or by design, and have contaminated ground water. . . . Pollution of this type can travel considerable distances and has been known to persist in the water for a very long time after its discharge into the ground has been stopped.

. . . There have been cases where . . . oil has contaminated ground water. . . .

Cases where pollution has reached the ground water are probably more instructive than cases where it has not, but we have had few reported to us. . . .

There have been many instances of sewage contamination of water in highly fissured limestone and chalk; these have been mentioned before and have occurred in several countries. The pollution is usually bacteriological. . . . In one case in England an experiment with fluorescein as indicator showed that water entering a fissure travelled a distance of 16 kilometres into another catchment area in three days.

. . . there is no essential connexion between the rate of removal of bacteria and that of removal of dissolved organic and chemical matter. It is the general experience, however, that the latter travels further, sometimes twice as far and sometimes up to 30 times as far. . . .

It appears that the most common known cause of chemical pollution of ground water has been waste liquid from gas works and other works engaged in the carbonization of coal and the processing of tar. . . .

Abstract (continued)

. . . such pollution has been known to travel for distances of a kilometre ore more. Usually the trouble is due to phenols, but in two or three cases in England the ground water has been found to contain thiocyanate, which may be destroyed less quickly than phenol. Thiocyanate is particularly dangerous, as on chlorination it forms cyanogen chloride which is as highly poisonous as cyanide. . . .

Cases have also been cited of ground water pollution by nitro-compounds, for example, waste waters from the manufacture of picric acid. . . .

Another waste which has caused severe pollution is one containing chromate. This may travel unchanged through the rocks and persist for years. In one case in the United States of America ground water contained 40 mg/l chromium as chromate. . . .

It should be emphasized that chemical pollution of this type is not confined to wastes discarded in the liquid state. It may be caused equally by the leaching out of dumps of solid wastes. . . .

There have also been cases of ground water becoming contaminated with neutral salts originating at the surface through the activities of man. Indeed, most of the wastes, including sewage, mentioned hitherto contain neutral salts. In addition, there are saline mine-waters and residues from various chemical processes which contain sulfates, chlorides, etc. We use the term "neutral" in the rather specialized sense as defining salts which pass through the ground unchanged. . . .

. . . cases of pollution have occurred due to effects, direct or indirect, of organic matter from garbage dumps, from sugar manufacture, in dairy wastes, and even in polluted river water allowed to percolate into the ground. In all these cases the discharges have exceeded the purifying capacity of the ground. . . .

Much polluting matter of various types occurs, or is placed, on the surface of the ground in Europe in circumstances where it can percolate downwards to the ground water. . . .

There have been cases where ground water has been contaminated, so much so that it has become quite unsuitable for drinking and sometimes other purposes. Some of these cases have been very serious and they constitute a grave warning for the future.

Descriptors - contined

biological action
purifying capacity
bacteria
phenols
thiocyanate
cyanogen chloride
cyanide
picric acid
leaching
dumps
solid wastes
organic matter
garbage dumps
sugar manufacture
dairy wastes
artificial replensihment
experiments
protection
treatment
laws

Disease/Solid Waste
Abstracts

No. **DSW-** 715

Author

Leo Kartman

Title

Plague Infection in Rattus Rattus in

San Francisco

Reference

Zoonoses Research

Doc. No.	**Contract No.**	**Date issued**
V. 2, p. 67		April 1963

Abstract

On February 23, 1963, a roof rat (Rattus rattus alexandrinus) was found dead in the backyard of a private home in the Marina District, ... tissue smears showed a nfew intact Pasteurella pestis and some dispersed P. pestis antigen. Tissues from this rat were inoculated into two guinea pigs and one of these animals died on March 7 with typical gross pathology of plague infection. Bacteriologic, serologic tests, culture, and sub-inoculations absolutely confirmed infection with P. pestis.

This finding represented the first isolation of plague bacilli in San Francisco since 1941. . . .

. . . an immediate intensive rat and rat flea survey . . . continued for about ten days and was followed up by a DDT dusting campaign in homes of the areas concerned. To date (25 April 1963) no additional infected material has been found.

There seems little or no evidence that an epizootic was taking place among rats in the city. The most plausible theory is that the particular rat either migrated from an area in which it had commingled with wild rodents undergoing an epizootic or that it was brought in by some vehicle. Wild rodent populations are located fairly close to the area in which the rat was found, however we have not been able to isolate any infection from field mice or their fleas in that area. Rat fleas,(Xenopsylla cheopis) have been found on some individual field mice and this certainly indicates commingling of domestic rats and wild rodents in the city.

Descriptors

plague
roof rat
Rattus rattus alexandrinus
Pasteurella pestis
rat
rat flea
epizootic
fleas
Xenopsylla
field mice
wild rodents

Disease/Solid Waste
Abstracts

No. DSW- 716

Author

G. Burke

Title

Summary of Recent Abstracts:
Plague

Reference

Tropical Diseases Bulletin

Doc. No.	**Contract No.**	**Date issued**
Vol. 62 No. 7, p. 605-610		1965

Abstract

A volume published in accordance with the policy of the Ministry of Health of the U.S.S.R. (p. 386) contains specialist monographs on plauge and other diseases which occur in natural foci. The section on plauge contains more than 200 pages on epidemiology, epizootology, treatment, pathogenesis, bacteriology and immunity.

Baltazard and Brygoo (p. 387) review present knowledge of distribution, epidemiology, prevention and treatment of plague in a conference paper of 21 pages.

Descriptors

plague
epidemiology
epizootology
treatment
pathogenesis
bacteriology
immunity.
prevention
rodent plague
transmission: control
fleas
vaccine
vaccination

Disease/Solid Waste Abstracts

No. DSW-717

Author

L.J. McCabe and T. W. Haines

Title

Diarrheal Disease Control by Improved

Human Excreta Disposal

Reference

Public Health Reports

Doc. No.	Contract No.	Date issued
Vol. 72, pp. 921-28		1957

Abstract

The effect of fly control on the reduction of diarrheal disease has been demonstrated twice. . . .

The exclusion of flies from their source of human enteric pathogens should prevent fly transmission of shigellosis. An experiment was therefore designed to measure the effect of excluding flies from contact with human excrement in an area where they had previously had ready access to such excrement. Flush toilets, water-carried sewage, and sewage treatment would have been the most effective method, but for the purposes of this study a cheap and easily effected alternative was necessary. An adaptation of the bored-hole latrine was used.. . .

This privy rehabilitation prgram was conducted in Boston, Ga. (1950 population, 1,035). . . .

. . .the majority of the muscoid group showed a marked decrease. . . . . . . this rate of breeding is significantly lower than the rate of housefly breeding in the check towns . . .

The reduction of housefly breeding observed in rehabilitated privies had no appreciable effect on community fly populations. Since houseflies have been found to breed in a greater variety of media that have other common muscoid flies, it was to be expected that the reduction of breeding in one medium would have little effect (3). . . .

During the 18 months of observations after the privy remodeling program was completed, Boston had a significantly lower rate of Shigella infections than it had before the program, 2.8 percent vs. 4.7 percent . . . . The infection rate in Boston was higher than in the check towns for the 13 months before the program (4.7 vs 3.3 percent), but after the privies were remodeled the Boston rate was lower (2.8 vs 5.7 percent). . . .

Descriptors

diarrheal disease
excreta
fly control
shigellosis
human excrement
flush toilets
sewage
sewage treatment
privy
housefly breeding

infection rate
excreta disposal

Abstract (continued)

After the excreta disposal methods were improved, the reported diarrhea rate in Boston was only half as high as in the check towns.

The bored-hole privy of the design used in this study did not exclude all houseflies from human excreta, but its low attractiveness to houseflies did mitigate this problem somewhat.. . .

Results of this study show the approximate maximum level in the reduction of Shigella transmission that can be obtained and maintained by the use of good privies alone. With a water-carried excreta disposal system, the exclusion of flies from human excreta would be more effective than with privies. .. .

Reference

3. Haines, T. W.: Breeding media of common flies. II. In rural areas. Am. J. Trop. Med. & Hyg. 4:1125-1130, November 1955.

Disease/Solid Waste
Abstracts

No. DSW-718

Author

William C. Carter

Title

Trichinosis - An Epidemiological Report

Reference

Public Health News, New Jersey State Dept. of Health

Doc. No.	Contract No.	Date issued
Vol. 38 (6), p. 205		June 1957

Abstract

During the year 1956, I investigated 45 cases of trichinosis in the Central State Health District. . . . fourteen were hospitalized resulting in an average loss from work of one month. One death was reported. The infected food consisted of smoked kolbasi, ground beef, and canned hams.

"It is estimated that 21,000,000 persons in the United States and Canada have been infected with trichinella spiralis (trichinosis). Of the 350,000 new infections which, it estimated, develop in the United States each year, only 16,000 exhibit clinical symptoms."

Because swine which feed upon raw garbage is the principal reservoir of trichinosis, positive measures can be taken to reduce the prevalance to a minimum. . . .

Descriptors

trichinosis
outbreaks
kolbasi
beef
hams
incidence

Disease/Solid Waste
Abstracts

No. DSW- 719

Author

Title

Combating Diarrhoeal Disease in Latin Americ

Reference

WHO Chronicle

Doc. No.	**Contract No.**	**Date issued**
Vol. 18, pp. 260-4		July 1964

Abstract

. . . The reduction of mortality in early childhood will require efforts to improve the economic and social situation, the nutrition of the people, and environmental sanitation - a process that must take many years. Even in the absence of such improvement, however, organized health care services can greatly reduce mortality in a relatively short period.

A million children under five years of age die every year in the countries of Latin America; almost 250,000 of these deaths are attributed to diarrhoea, accounting for 90% of all deaths from this cause in the countries concerned.

. . . Shigella and Salmonella species have long been implicated, and in the past ten years enteropathogenic strains of Escherichia coli have also frequently been incriminated. . .

In Venezuela recent movements of large numbers of country dwellers into city slum areas have been associated with a considerable increase in cases of diarrhoea. Shigella has assumed renewed importance and Entamoeba histolytica has often been recovered from cases of diarrhoea with bloody stools . . . children under two years of age.

The relative importance of viruses in endemic diarrhoea is at present disputable.. .

Descriptors

sanitation
children
diarrhoea
Shigella
Salmonella
Escherichia coli
Entamoeba histolytica
antibiotics
antibacterial drugs

Disease/Solid Waste
Abstracts

No. DSW- 720

Author

C. B. Lofton, S. M. Morrison, & P. D. Leiby

Title

The Enterobacteriaceae of some Colorado small mammals and birds, and their possible role in Gastroenteritis in Man and domestic animals

Reference

Zoonoses Research, V. 1, No. 15, 30 Dec. 1962

Doc. No.	**Contract No.**	**Date issued**
p. 227-293		

Abstract

In a study of 589 small wild mammals collected in 9 countries of Colorado, 15 (2.5%) yielded Salmonella isolations.

A total of 14 (2.4%) rodents yielded Escherichia coli serotypes known to be pathogenic to man....

The relatively high incidence in some rodents indicates that they like domestic animals, may serve as significant reservoirs of Salmonella and pathogenic E. coli. These isolants again illustrate the wide range of host-parasite adaptation displayed by Salmonella and the pathogenic E. coli serotypes.

The relatively high incidence of Salmonella found in this preliminary study indicates that birds may serve as an important reservoir of these organisms in the mountain pasture and watershed areas of the state.

Descriptors

diarrhea
wild mammals
reservoirs
birds
watershed
Salmonella
Escherichia coli
host-parasite adaptation
pasture
gastroenteritis

Disease/Solid Waste
Abstracts

No. DSW- 721

Author

L. Ajello

Title

Histoplasma Capsulatum Soil Studies

Reference

Mykosen, V. 3: 1960; pp. 43-48

Doc. No. **Contract No.** **Date issued**

Abstract

A prediction for avian habitats by H. capsulatum, that is believed to be significant but not absolute, has been uncovered. ...H. capsulatum was more apt to occur in sites frequented by chickens than from any other habitat....

Sixth graders participating in a class gardening project, collected potting soil under trees utilized by grackles as a roost. A sack of leftover soil was stored in the classroom and was tossed around by the children. Following the outbreak of pulmonary histoplasmosis, soil from a flower pot, the sack and grackle roost site was examined for the presence of H. capsulatum and found to be positive.

H. capsulatum has been recovered also from soils not obviously connected with birds. Bat habitats also appear to favor the occurrence of this fungus as shown by Emmons....

...Episodes have been investigated in Tennessee.... From 5 of these, H. capsulatum was isolated. All of these came from chicken habitats or chicken manure.

...Other systemic pathogenic fungi were encountered in the course of these soil studies. Laboratory studies indicate that chickens are not susceptible to infection by the macroconidia of H. capsulatum....

Domestic fowl do not excrete spores of H. capsulatum in their droppings. They do not seed soil with this fungus.... ...There is no basis to support the theory ...that H. capsulatum is carried by birds....

Summary

A total of 2,626 soil samples from 18 states of the United States of America and 10 foreign countries were examined for the presence of Histoplasma capsulatum and other systemic pathogenic fungi.

From these, 117 isolates of H. capsulatum were obtained as well as 26 of Allescheria boydii, 16 of Cryptococcus neoformans, 4 of Sporotrichum schenckii, and

Descriptors

Histoplasma
fungi
bird species
histoplasmosis
pathogenic fungi
Allescheria boydii
Candida albinans
soils
spores
gardening
bat habitats
infection
Cryptococcus neoformans
Coccidioides immitis
disease
avian habitats
grackles
manure
H. capsulatum
Sporotrichum schenckii

Abstract (continued)

scheria boydii, 16 of Cryptococcus neoformans, 4 of Sporotrichum schenckii, and one each of Candida albicans and Coccidioides immitis.

These studies revealed an association of H. capsulatum with various animal habitats, and served to uncover new endemic foci for H. capsulatum.

**Disease/Solid Waste
Abstracts**

No. DSW- 722

Author Proceedings: 65th Annual Meeting

Title

Further Studies on Salmonella in Human and Animal Foods and in the Environment of Processing Plants

Reference

United States Livestock Sanitary Assoc.
Minneapolis, Minn.

Doc. No. **Contract No.** **Date issued**

Oct. 31, 31, Nov. 1, 2, 3, 1961

Abstract

Salmonellae have been isolated from many varied sources of public health importance (1-5). Of primary concern are certain human and animal food products, environments of the plants where these foods are prepared, animal by-products from which the food is prepared, and animal feeds.

A high percentage of fresh pork sausage samples were found to contain salmonellae by Galton, et al. (6), and Richardson, et al (7). . . . It was noted that the product of one local producer was consistently positive. . . . . . . this firm agreed for the . . . Communicable Disease Center to study the environment of its plants. . .

. . . findings indicate inadequate cleaning which allowed carry over of contamination with salmonellae from the previous day. . . .

. . . The average frequency of isolation of salmonellac from a specific point was never lower than 40 percent. Salmonellae were isolated from four of five samples from the floor of the trucks used to transport carcasses from the slaughter plant to the processing plant. . . .

Rectal Swab Cultures from Swine

. . . Positive samples from these animals increased from nine percent at the sale barn to 84 percent after dehairing. The recovery of salmonella by rectal culture from these animals appeared to be related to their length of association under crowded conditions.

. . . finished feed samples were examined for the presence of salmonellae. . . . (16 percent) were found positive, . . . Seventeen specimens of food ingredients were examined and eight (47 percent) of these were positive. . . .

. . . a limited number of dried cake and bread mixes have been examined. Of 22 boxes of these materials cultured, salmonellae were isolated from three (14 percent).

Descriptors

Salmonellae
public health
animal food products
foods
animal feeds
sausage
slaughter
hogs
contamination
carcasses
swine
animal by-products
cake
bread mixes
dried egg
egg whites
Salmonellae serotypes
aerosol
evisceration
poultry
dust
pig faeces
human salmonellosis
food preparation

Abstract (continued)

These three products contained dried egg or egg whites. The typesfound included S. tennessee, S. infantis and S. oranienburg.

. . . The slaughter and processing of swine infected with salmonellae resulted in the production of an extensively contaminated human food product under the conditions in the plant studied. . . . The apparent spread by aerosol could be controlled more effectively. . .

. . . During the evisceration process, the contamination of the outside of carcasses increased . . .

In the studies of rendering plants, a high percentage of rendered materials and ingredients of poultry origin being used as protein supplement in animal feeds were found to contain Salmonella. . . .

With the exception of one plant, all had open conveyor systems designed so that uncooked material could easily become mixed with the cooked materials. . . . It has been shown that dust particles carrying salmonellae can contaminate materials which may support the growth or survival of the organism. . . .

. . . it is obvious that many animal protein supplements are contaminated with Salmonellae and offer a source of animal infection. These infected animals may eventually find their way to slaughter. During the slaughter and processing the carcasses frequently become contaminated with Salmonella. The foods prepared from these carcasses are potential sources of human infection.

Salmonella infections continue to be important problems facing the livestock and poultry industries. The presence of Salmonella organisms in feedstuffs, particularly animal by-products, has been reported in this country as well as Europe.

Summary:

1) The bacteriological examination of 980 samples of animal by-products from 22 states indicated Salmonella contamination of 175 samples.

2) Forty-three Salmonella serotypes were identified. Many of these serotypes have been isolated from poultry and livestock submitted to diagnostic laboratories.

3) Additional investigation is essential to develop sanitation standards which may be used by various phases of the feed industry to minimize contamination of feedstuffs with Salmonella and other pathogenic organisms.

. . . in spite of the numerous reports in the literature as to the high incidence of salmonellae in animal feed constituents, information concerning their actual significance in human and animal health appears to be inadequate.

. . . In . . . research, investigations have been made on the incidence of salmonellae in pig faeces at the farm level, as well as at the time of slaughter. . . . on the incidence of bedding material obtained from trucks used to transport pigs from farm to market, and in holding pen deposits used by both the stock yards and packing establishments.

Results of our investigations definitely confirmed that a relatively high percentage of rendered animal by-products used as feed constituents contain salmonellae. Approximately 61 percent of the samples examined were found to be positive. Of particular interest to us was the apparent high correlation between the total bacterial count of these samples and the presence or absence of salmonellae. . . .

Abstract (continued)

Of even greater interest is the rather low incidence of salmonellae in pig faeces obtained at the farm level. Among 75 samples examined, only two were found to be positive. . . . It should be remembered, however, that the techniques employed were less adequate in detecting small numbers of salmonellae in faeces than in other samples examined.

. . . We must know what the potential human and animal health hazards are. Is the problem of economic significance? Industry is now well advanced into this second stage. It should be realized, however, that more conclusive evidence as to the significance of salmonellae in animal feeds in this country is badly needed. Do salmonellosis outbreaks in farm animals frequently result from consumption of animal feeds containing small numbers of salmonellae? Can a carrier state in the animal be established? Is it of economic importance as far as animal health is concerned? Is the problem of importance in human health? These questions cannot be adequately answered at this time. . . .

. . . most rendering establishments in the United States were designed with an eye to engineering efficiency because of high labor costs. Such designs often are not compatible with desirable hygienic procedures. Employees often have duties to perform having to do with handling both the raw and rendered products. Frequently, there is no physical separation between the areas handling the raw and rendered product. Numerous other violations of good hygienic practice may be witnessed in such establishments. . . .

In regard to human salmonellosis, I think the danger lies not so much in the presence of Salmonellae in one product or in another product. I think that the danger lies in their introduction into the area of food preparation., whether this be in a commercial institution or in the home. . . . . . .I am in complete agreement with Doctor Newell that salmonellosis in man and animals should be a reportable disease and this will require the close cooperation of public and private agencies dealing with animal and human health, the practicing physician, the practicing veterinarian, the health officer, the veterinary health inspector, the sanitarian, and the laboratory worker. . . .

Disease/Solid Waste
Abstracts

No. DSW- 723

Author

J. J. Carrell

Title

Safety in Refuse Collection

Reference

Public Works

Doc. No.	**Contract No.**	**Date issued**
Vol. 91 (4), pp. 89-92, April 1960		

Abstract

Only limited conclusions can be drawy. . . Refuse collectors undoubtedly are confronted by more hazards than employees in most other occupations, and some of the dangers can result in severe, as well as minor accidents. In addition, there are different hazard levels in different cities. Narrow streets, old equipment, variation in requirements for refuse containers and other factors can account for a more dangerous environment for the department in city "X" as compared to city "Y".

. . . it can be said that there are four circumstances in which most accidents take place:

1. In driving and riding trucks (including circumstances where truck is moving and crew is on the ground);
2. In loading: a) getting, lifting and carrying containers, b) filling hopper or other loading action including mechanical loading cycle;
3. In unloading; and
4. In cleaning the vehicle.

Descriptors

safety
refuse collection
frequency and severity rates
accidents
driving
loading
unloading
cleaning

TABLE 1 - Frequency and Severity Rates for Accidents in Selected Industries, 1958

Industry Group	Position Among All Industries	Frequency Rate	Severity Rate
Marine Transportation	Worst frequency record	33.23	1,214
Coal Mining	Worst severity record	27.39	5,975
Communications	Best record	.97	85
Construction Industries		16.99	2,538
All Industries		6.17	744

Table 2 - Frequency and Severity Rates for Accidents in Selected Governmental and Governmental-type Units, 1958

Unit	Frequency Rate	Severity Rate
State Highway Depts.	10.96	1,481
Water Utilities	17.69	1,009
Municipal Employees	15.04	539
Police	27.07	1,094
Fire	21.63	1,886
Parks	20.29	430

Table 3 - Frequency and Severity Rates for Accidents in Refuse Collection Service in Selected Cities

City	Time Period	Frequency Rate	Severity Rate	Motor Vehicle Action Cases per 100 Vehicles	Accidents per Refuse Collection Vehicle	Accidents per 100 Employees
Baltimore (1)	1957	101.52	-	-	-	-
	1958	116.11	-	-	-	-
Kansas City (2)	1958	-	413	-	1.6	52
Milwaukee (1)	1958	107.4	912	-	-	-
New York (3)	1958	16.61	432(a)	.163	.646(b)	12.0(c)
Various Sanitation Departments(4)	1956	51.2	-	-	-	-
	1957	53.6	-	-	-	-
San Diego (5)	1957-8	41.5(d)	966	-	.30	9.0
	1958-9	24.5	732	-	.19	5.0

(a) Rate without fatalities; the rate with fatalities was 1.291. (b) Computed on basis of typical number of vehicles in use on a given day, 1801, and "action accidents" involving property damage, 1165. Figures supplied by Paul R. Screvane; computation by author. (c) Computation on basis of 9680 employees and 1165 action accidents involving property damage. (d) Computed on basis of lost-time accidents only.

Table 4 - City of Baltimore Accident Statistics, 1957

Bureau of Department of Public Works	Disabling Injuries Frequency Rate	 Severity Rate
Building Inspection	14.01	8,675
Highways	19.17	135
Mechanical-electrical Service	20.88	287
Sewers	22.77	523
Surveys	20.14	87
Transportation	21.46	189
Water supply	19.87	172
Sanitation	36.05	2,148

Disease/Solid Waste
Abstracts

No. DSW- 724

Author G. Allen Mail, Wm. V. Hartwell, George R. Hayes, Jr., Arnold J. Funckes

Title

Study of Hazards in Disposing of Insecticide Containers at a City Landfill.

Reference

Public Works

Doc. No. **Contract No.** **Date issued**

Vol. 91, pp. 110-111, July 1960

Abstract

Many municipalities must face the problem of disposing of containers and toxic waste materials resulting from the manufacture, formulation, and use of pesticides. The study outlined here was instituted to solve such a problem in the City of Phoenix, Arizona.

. . . There was, . . . a potential hazard to bulldozer operators in the disposal of fiber and metal drums which had contained concentrates of toxic organic phosphorous insecticides such as Phosdrin, Thimet, and parathion. These fiber and metal drums in good condition are eagerly seized upon by scaventers at most disposal sites. The presence of usable containers would constitute a distinct health hazard to these individuals.

In order to reduce the possible hazard, all fiber drums designated for disposal at the landfill were crushed at the insecticide plants to eliminate the clouds of dust which might arise if the landfill bulldozer did the crushing. Metal containers were washed three times with water and rendered unserviceable by multiple punctures before being discarded. The crushed fiber drums and punctured cans were divided into two lots; each lot was mixed with a load of paper fefuse and taken to the landfill at designated times. Plant floor sweepings collected after formulating and bagging operations were not sent to the landfill but were disposed of on the premises of the plant.

Observations on the bulldozer operator started before the first load was dumped. Blood was taken for the determination of baseline cholinesterase, an anzyme inhibited by organic phosphorous compounds. The operator was instructed to save all urine as individual voids during the study for the measurement of paranitrophenol, a metabolite of parathion.

Descriptors

toxic waste
pesticides
disposal
scavengers
health hazard
hazard
bulldozer operators
drums

Abstract (continued)

An hour before delivery of the contaminated loads, a fresh filter was inserted into the bulldozer operator's respirator. He was given an alcoholic handwash, and gauze pads were attached to his shoulders, back and right and left breast. After the loads had been compacted and covered according to the usual landfill procedure, the gauze patches were removed and another alcoholic handwash was given. These samples then were analyzed for parathion content.

The results of chemical analyses carried out on blood, urine, alcoholic handwashes, and patches indicated that the operator's exposure to parathion was minimal. . . . The paranitrophenol found was 50 to 100 times less than that found in such occupationally exposed individuals as drop dusters.

Disease/Solid Waste Abstracts

No. DSW- 725

Author

Phillips Thygeson

Title

Epidemiologic Observations on Trachoma in The United States

Reference

Invest. Ophthalmos

Doc. No.	**Contract No.**	**Date issued**
Vol. 2(5), pp. 482-489,		Oct. 1963

Abstract

Trachoma has been a disease of the white population of the United States since colonial times. It was particularly prevalent among the mountain people of Scotch-Iris descent in the Virginias who migrated west across the Appalachians along the so-called "Daniel Boone Trail" to what is now Kentucky, southern Indiana and southern Illinois, Missouri, Oklahoma and Arkansas.

. . . All observers have noted the close relationship of the disease to poverty and poor personal hygiene.

Trachoma has been a common disease of the American Indian for at least a hundred years[3], and very likely since before the white man's arrival on the American continent.. . .

Trachoma never has been an important disease of the American Negro even though poverty and poor personal hygiene have been common features of Negro life. It is found among oriental immigrants on the West Coast, in spite of strenuous efforts on the part of immigration officials to exclude it, and there are important foci in the Mexican population of our western states. . . .

Although trachoma is still endemic in the white and Mexican populations, and still a major disease problem of the Indians of the southwest, in recent years it has diminished strikingly in the white population and among the northern Indian tribes. . . .

. . . trachoma is known to spread chiefly in the home, . . .

Other factors in the home environment with a bearing on epidemiology include: (1) availability of water for washing, (2) cultural and religious traditions of the family, (3) educational status of the parents,(4) dust, and (5) flies. . . . The health consciousness that develops with education is almost inevitably associated with a low trachoma index. . . .

Descriptors

trachoma
disease
American Indian
home
family
educational status
occupation
treatment
United States
conjunctivitis
American Negro
poverty
personal hygiene
water
dust
flies
school
epidemiologic patterns
vaccine

Abstract (continued)

Dust in the home and dust storms in the environment cause eye irritations mechanically. The eyes are then rubbed and various types of conjunctivitis, particularly the bacterial types . . . which may act as carriers for trachoma virus, are transmitted to the eyes by contaminated fingers. The fly has been incriminated by most trachomatologists as a mechanical transmitter of epidemic bacterial conjunctivitis, and by some as a transmitter of trachoma virus. However, although a number of attempts have been made to cultivate virus from flies that have been in contact with the trachomatous conjunctiva, only failure has been reported.

A gnat-born Kock-Weeks seasonal conjunctivitis is common in several of our southern states, . . . and in the Coachella valley of California where it is associated with trachoma. . . . .

. . . In the absence of an effective vaccine, or of an effective short-term method of treatment, it would seem that trachoma can be eradicated in the southwestern United States only by (1) treatment of a large percentage of affected adults, (2) control of seasonal conjunctivitis, (3) control of flies, and (4) prompt detection and treatment of affected individuals.

REFERENCE

3. Fox, L. W.: The Indian and the trachoma problem. Am. J.OPhth. 12:457, 1929

Disease/Solid Waste
Abstracts

No. DSW- 726

Author
Robert G. Fischer & Jerome T. Syverton

Title
The Cockroach as an Experimental Vector
of Viruses

Reference
Bact. Proc.

Doc. No. **Contract No.** **Date issued**
p. 95, May 27-31, 1951

Abstract

The most probable explanation of the natural mode of transmission for the poliomyelitic and Coxsackie groups of viruses is that of a fecal-oral dissemination with the alimentary tract as a portal of entry. The incrimination of flies as potential vectors suggests that cockroaches can operate similarly, since in many parts of the world the association of cockroaches with man's food and excreta exceeds in constancy and intimacy that of flies.. . . Accordingly, the cockroach, Periplaneta americana, was investigated under laboratory conditions to learn its ability to acquire by feeding, to maintain intracorporeally, and to excrete representative members of the polioencephalomyelitic and Coxsackie groups of viruses. The studies that demonstrated the successful maintenance and excretion of mouse encephalomyelitic virus, GDVII strain, were reported recently. . . . Sufficient Coxsackie virus was excreted daily over a period of as long as 15 days to paralyze and to kill on intraperitoneal injection the test recipient, 1-to-2 day old mice. Similarly, feces from the same species of cockroach that had been fed poliomyelitis virus resulted on transfer to monkeys over a period of days in immunization, paralysis, or death. The identity of each virus after recovery from recipient animals was established.

Descriptors

cockroach
experimental vector
viruses
Coxsackie groups of viruses
transmission
Periplaneta americana
poliomyelitis virus

**Disease/Solid Waste
Abstracts**

No. DSW- 727

Author

Hermann Peters

Title

The House Fly as a Disease Carrier

Reference

Pest Control

Doc. No. **Contract No.** **Date issued**

Vol. 33(5) pp. 16-20, 1965

Abstract

A question which must be answered is: When does the house fly's potential hygienic importance become a real danger to human health? And if it indeed does, what are the conditions which bring this danger about?

For the moment, we will put aside the problem of where and how the house fly can contaminate itself, and ask instead:

1. What real potential does the house fly have to contaminate human food with germs from any source?

2. What possibility is there that other flies which live with humans will contaminate food?

Answers to both questionsdepend upon the density of flies in the human environment. . . .

. . . there is a characteristic average of house flies in a dwelling of a certain type.

After many examinations, we know that livestock manure, particularly of cows, is a preferred diet of house fly maggots. Thus we can assume that a stable or barn must be a major egg-laying place for the house fly. Places where organic wastes lie long enough for maggot development are also used for egg laying. In a city area, concentrations of refuse, such as dumps, are breeding places. . . .

. . . About 12% of adults emerging from a breeding area stay at that place or probably will return there to lay eggs after feeding and mating.

About 30% migrate to structures and inhabit rooms which are used to supply or prepare human food (other than dwellings). We've found these structures to be primarily milk shops (18%) and meat markets (6%). House fly preference for blood and other animal proteins is important.

Descriptors

house fly
disease
health
food
germs
density
dwelling
meat
blood
Fannia
pathogenic
tannery
garbage dumps
boneyards
Drosophia

livestock
manure
cows
refuse
dumps
breeding places
milk
protein
little house fly
blow flies
Lucilia
Calliphora
flush toilets
refrigerators
transmission

Abstract (continued)

. . . human dwellings attract 29% of the house flies from a single breeding place. This is a very strong attraction.

From a hygienic standpoint, we were shocked to find in a suburb of Stuttgart that there were nearly 2½ times more flies in farmhouses than there were in the nearby stables. . . .

. . . When we compared the house fly and the little house fly, we discovered a characteristic trend that the house fly is a kitchen fly and Fannia sp. is a latrine fly . . .

. . . However, the house fly will be attracted to pathogenic stools (feces) which are bloody, or dyspeptic, since the latter involves undigested animal proteins.

. . . the living human body is highly attractive to the house fly. . . .

. . . Lucilia and Calliphora . . . feed upon feces and carcasses respectively. . . .

Other preferred breeding places for blow flies are the tannery, garbage dumps, and boneyards, but all thesd areas are usually distant from housing. . . .

Even if blow flies do have a high potential hygienic importance as vectors, the importance is limited, particularly inside buildings, because of their small numbers. In modern dwellings with flush toilets and refrigerators, neither feces nor protein foodstuffs are available in sufficient amounts to attract blow flies into our immediate surroundings to contaminate our foodstuffs.

House flies constitute the highest percentage of all flies found in dwellings. Only occasionally will populations of Fannia spp. or Drosophila spp. be more numerous. . . .

Regular evaluation of hygienic importance of flies such as the house fly, the little house fly, and Drosophila flies shows us that under normal conditions they do not fly back and forth between feces and foodstuffs. The alarmingevent is their periodic invasion into kitchens and living rooms directly from their germ-laden breeding sites like garbage cans and dunghills. . . .

There are many more facts which should be evaluated so we can combat the fly menace. For instance we do not know how many flies per cubic meter or per square foot of wall space constitute a real danger of pathogenic microbe transmission to occupants of a home. But until this evidence is found, we must conclude that the house fly, because of its numbers, habits, and attraction to human dwellings, must continue to be placed in the first group of synanthropic flies: those dangerous as germ transmitters.

Disease/Solid Waste
Abstracts

No. DSW- 728

Author

J. L. Braun, W. F. McCulloch, and F. H. Top

Title

Further Observations on the Epidemiology of

Leptospirosis in Iowa

Reference

Zoonoses Research 3(1):39-46, 1964

Doc. No. Contract No. Date issued

Abstract

Leptospirosis is transmitted from domestic animals to man primarily by infected tissues, blood, and urine. Persons engaged in the slaughter of cattle and swine comprise special risk groups. This report presents data obtained from a study of 40 cases of leptospirosis occurring among Iowa abattoir employees.

One may assume that carrier animals and animals in all stages of infection will be sent to slaughter. The use of mesh gloves, boots, and rubber aprons, for example, while affording some degree of protection, certainly cannot be expected to be an effective bar to the entrance of organisms which are presumed to pass minute dermal discontinuities or the oral or conjunctival mucous membranes.

Descriptors

Leptospirosis
Leptospira pomona
blood
abattoir workers
occupations
abattoir
swine
urine
infection
disease
cattle
tissues
slaughter
protection

Disease/Solid Waste
Abstracts

No. DSW- 729

Author

M. T. Parker

Title Symposium on HUMAN AND ANIMAL SOURCES OF GASTROINTESTINAL INFECTION

(a) The Spread of Some Bowel Infections from

Reference Human Sources

Royal Sanitary Inst. Journal, V 74:847-55

Doc. No. **Contract No.** **Date issued**

1954

Abstract

The bowel diseases that were an important cause of death in this country during the nineteenth century have now become rare or have disappeared entirely. In cholera and typhoid fever infection is contracted by swallowing pathogenic bacteria derived from human faeces, or occasionally from human urine. The control of these diseases was achieved by the provision of safe drinking water and the prompt disposal of excreta. However, other bowel infections spread from man to man in the faeces are still vary prevalent and show no signs of becoming extinct. It is probable, therefore, that the routes of transmission of the current infections differ from those of cholera and typhoid, and that quite different preventive measures will be required to control them.

I-TYPHOID FEVER

Food-borne outbreaks of typhoid fever now occur rather rarely and no major water-borne outbreak has been reported since 1936. Most incidents consist of sporadic cases or small groups in families, and a study of their distribution suggests that nearly all arise from separate sources, most of which are middle-aged and elderly chronic (i.e. permanent) carriers. Family contacts seldom become infected from cases.

Since water-borne spread has become rare insufficient fresh infections have been occurring to maintain the number of chronic carriers in the population.

II-THE MORE PREVALENT BOWEL INFECTIONS

Infections with the following organisms are common at present.

Salmonella paratyphi B (Paratyphoid fever)-Practically all infections are of human origin. The organisms are excreted in the faeces and, less commonly, in the urine.

Descriptors

diseases
food-borne outbreaks
Salmonella paratyphi B
Salm. paratyphi B
dysentery
human faeces
typhoid fever
(Paratyphoid fever)
faecal excretion
Britain
water-borne spread
Salm. typhi
Shigella sonnei

Abstract (continued)

Other salmonellae-Most types other than Salm. typhi and Salm. paratyphi B infect lower animals as well as man. although some human infections are from animal sources there is evidence of considerable spread from man to man also. Faecal excretion is the rule.

Shigella sonnei (Sonne "dysentery") infection is entirely from human sources and is conveyed by faeces.

Paratyphoid and other salmonella infections- ...recognizable food-borne outbreaks account for a relatively small proportion of all infections. Nearly half of the infected persons formed part of sporadic incidents in families.

Sonne "dysentery"- Recognizable food-borne outbreaks are quite uncommon.... Four fifths of the notified infections occurred in institutions and one-fifth as sporadic cases and groups in families.

III-FOOD-BORNE OUTBREAKS

The investigation of food-borne outbreaks, other than typhoid, seldom yields definite evidence of the source of infection. If a food-handler is found to be excreting the causative organism it is often impossible to decide whether he was infected before the outbreak or is a victim of it.

IV-THE NATURE OF SPORADIC INFECTION

The high proportion of mild and symptomless infections...makes it likely that we are studying only a small proportion of the total incidence, and that many connections between incidents will be missed. These links may include not only "submerged food-borne outbreaks, but chains of person-to-person spread.

Sporadic paratyphoid infection - In June, 1952, there were eleven primary cases in the Manchester area associated with the consumption of cream confectionery.... At no time during the four years was the incidence of clinical disease high, but there was evidence of fairly widespread infection in the population.

Sporadic infection with other salmonellae - The pattern of sporadic infection with salmonellae other than Salm. typhi and Salm. paratyphi B. is difficult to investigate because of the frequent importation of fresh strains from animal sources. There are grounds for believing that a good deal of direct person-to-person spread occurs with Salm. typhi-murium.

Sporadic Sonne infection - Very little is known about the spread of Sonne infection in the general population.

V-INSTITUTIONAL OUTBREAKS

Salmonella "cross infection" in hospital - Of 292 people infected with salmonellae while in hospital...206 were less than two years old and 190 of these were infected with Salm. typhi-murium. The disease seldom became established in wards unless the majority of patients were under two years of age. Investigation of the outbreak led to the conclusion that the infant excreter was the main source of infection.

Sonne infection in day nurseries - Despite the rapid course of these outbreaks, it is possible that the mechanism of spread is much the same as in salmonella "cross-infection".

Abstract (continued)

The diarrhael diseases best adapted to survival under present conditions are those that give rise to a relatively small proportion of severe illnesses and a large proportion of trivial or symptomless infections. Drinking-water is nowadays an unimportant vehicle of spread, although occasional outbreaks following the contamination of food (especially milk) by polluted river and stream water still occur. Fly-borne dissemination is probably also quite uncommon, since the housefly is, in the main, denied access to human faeces.

The contamination of food by the unwashed hands of persons excreting pathogenic bacteria in the faeces is believed to be one of the most important means of spread. The hands are inevitably contaminated at defaecation and, unless washed, may transmit infection for at least half an hour afterwards.

**Disease/Solid Waste
Abstracts**

No. **DSW-** 730

Author John E. Gordon, Moisés Béhar
and Nevin S. Scrimshaw

Title

Acute Diarrhoeal Disease in Less Developed

Countries, 1 2 and 3

Reference

Bulletin WHO

Doc. No.	**Contract No.**	**Date issued**
Vol. 31, pp. 1-7 & 9-28		1964

Abstract

1. An Epidemiological Basis for Control *

The attempt to control the acute diarrhoeal diseases involves more than a restriction of the morbidity and mortality they cause. The attendant disability has important economic consequences. In less developed countries, where diarrhoeal disease is highly prevalent, a recognized synergism with nutrition seriously affects general health (scrimshaw, Taylor & Gordon, 1959). The resultant deterioration in nutritional status, frequently to the level of malnutrition, is reflected in impaired resistance to other infections and the precipitation of specific nutritional disorders, notably kwashiorkor. A community programme for the control of diarrhoeal disease is thus tied intimately to general health activities, and the relative emphasis it receives is of necessity a function of the broader effort. . . .

Acute diarrhoeal disease includes a proportion of specific enteric infections, such as shigellosis, salmonellosis and diseases caused by enteropathogenic colon bacilli, but it consists mainly of undifferentiated disease with no demonstrable specific infectious agent. The significant feature is that a similar clinical form occurs with all endemic diarrhoeas, whether of demonstrated specific etiology or otherwise. There is no characteristic clinical pattern, . . .

. . . Guatemala severe cases are more likely to be related to Shigella than to any other infectious agent and that cases with a demonstrated agent include more than a proportionate share of severe infections. However, a severe case has nothing to mark it as shigellosis, . . . and the majority of severe cases are of indeterminate microbial origin.

The occurrence of acute diarrhoeal disease in all populations of the world suggests innate host characteristics, physiological and biological, conducive to the

* INCAP Publication 1-315

Descriptors

1) disease
diarrhoeas
dysenteries
infants
young children
acute diarrhoeal
morbidity
mortality
nutritional disorders
kwashiorkor
syndrome
enteric infections

shigellosis
slamonellosis
enteropathogenic colon bacilli
undifferentiated disease
infection
faeces
direct contact
fingers
food
water
flies
immunity

Abstract (contined)

disease and common to all mankind. . . .

Not all acute diarrhoeal diseases are of infectious origin, but most of them are. Despite definite and diverse infectious agents, the main reservoir of infection is man. A few types of disease are of animal origin, notably salmonellosis as in Costa Rica (Moore & de la Cruz, 1959-61), but this disease also comes mainly from infected persons. In all recognized specific diarrhoeal disease, carriers have a significant place together with cases in the community reservoir ofinfection. . . . The immediate source of infection, faeces, is common to all infectious diarrhoeas, whatever the method of transfer.

All these diarrhoeas, whether etiologically distinct or undifferentiated forms of enteritis, have common modes of transmission. Only food poisoning has its own method of spread. Noteworthy differences occur, however, in the patterns of distribution. Endemic and sporadic diarrhoeal disease is transferred predominantly by direct contact, hand-to-mouth infection. Indirect contact through objects freshly contaminated with faeces has minor significance. Fingers other than those involved in direct contact spread infection by contaminating food and sometimes water stored in the household. Flies play a variable part, far less important than that of contact dissemination.

The classical concept of epidemic diarrhoeal disease is of disease originating from a common source (water, milk or solid foods), with the outbreak rising and falling abruptly (Gordon & Babbott, 1959; Gordon, Chitkara & Wyon, 1963; Scrimshaw et al., 1962). By contrast, most of the epidemics personally observed in rural areas of less developed regions have been spread by contact. Characteristically they were of slow evolution. They failed to reach the high peak of common-source outbreaks and usually followed a protracted course, occasionally as long as three years.

The duration of communicability in acute diarrhoeal disease is not well known. Most of the evidence relates to shigellosis, where infectiousness is essentially for the duration of symptoms and briefly thereafter. . . .

The known facts about resistance and susceptibility to acute diarrhoeal disease are also few. . . .

. . . In the Guatemalan experience, more than one attack occurred in about half of the children during the second year, and in one child out of three in each of the pre-school years. It is evident that one attack gives no genera immunity, and yet it is equally certain that resistance increases with age; older children and adults have far less diarrhoea. . . . A particular pattern holds for a particular place. Transfer to another area and the resultant contact with a new set of infectious agents brings a fresh need to accommodate, as is evidenced by the well-known "traveller's diarrhoea."

Conclusions

Acute diarrhoeal disease is a clinical syndrome, a collection of diseases, for the most part of infectious origin, some of specific etiology and some not. Most of them are undifferentiated, either clinically or microbiologically.

In less developed areas, signs and symptoms have an individuality sufficient to distinguis the disease from that occurring in economically and technically advanced areas. . . .

Abstract (continued)

2. Patterns of Epidemiologicak Behaviour in Rural Guatemalan Villages*
(John E. Gordon, Miguel A. Guzman, Werner Ascoli, & Nevin S. Scrimshaw)

The outstanding feature of attach rates in these village communities. . . was the extent to which the disease predominated in children aged from 6 months through 2 years. This was the period of weaning (Gordon, Chitkara & Wyon, 1963). Acute diarrhoeal disease was comparatively infrequent during the first six months, when infants were almost wholly breast-fed. . . . The three-month period immediately following the completion of weaning was also associated with high rates, numerically less than during the more stressful weaning period, but still statistically the same.

These results on the relation of breast-feeding and the weaning process to the incidence of acute diarrhoeal disease agree with those of a similar comprehensive field study in the rural Punjab area of India (Gordon, Chitkara & Wyon, 1963), . . . All death-rates were greater in the Indian area than in Guatemala: those for all deaths, for infant mortality and for neonatal deaths. However, in both areas, the proportion of deaths from acute diarrhoeal disease to total deaths was essentially the same, indeed somewhat greater in Guatemala during the second and third years of life. . . .

The increased opportunity for infection and the deteriorating nutritional state that accompany the change in diet at weaning are both important determinants of weaning diarrhoea, and they act synergistically.

A four-year study of acute diarrhoeal disease in rural Guatemala, with home visits twice monthly to all the families in three villages, demonstrated that the greatest frequency of the disease, as in most of the less developed countries, was among infants and younger pre-school children. Deaths from diarrhoeal disease at these ages were so numerous, in contrast to the few among adolescents and adults, that the disease was the first cause of death for the population as a whole. Most pre-school children over the age of six months had some measurable degree of malnutrition. The greater the malnutrition, the greater was the number of cases of acute diarrhoeal disease. The severity of the disease followed the same progression.

The incidence of diarrhoeal disease was greatest when children were being weaned and immediately thereafter. . . . It also occurred at a time of initial serious exposure to environmental risks and increased exposure to other than family contacts. . . . The mode of transmission was chiefly by direct contact. . . .

The characteristics of the disease, as evidenced by infants and toddlers, are sufficiently individual to justify the recognition of weanling diarrhoea as an epidemiological entity. Measures for control relay on improving maternal and child health practices, with strong emphasis on nutrition, on health education of the public, and on medical care of patients. Environmental measures were found less effective for this age-group, although they are considered a critical necessity in long-term community control. . . .

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* INCAP Publication 1-315

3. Methods for Prevention and Control*
(John E. Gordon, Moisés Péhar, & Nevin S. Scrimshaw)

. . . The dominant importance of weaning diarrhoea requires a main emphasis on maternal and child health procedures, with nutrition singled out for attention, along with public health education and medical care of patients: this in addition to the established worth of means for promoting environmental sanitation. The several features of the suggested programme are within four broad divisions: preventive measures; control of patients, contacts and the immediate environment; measures specifically useful in epidemics; and international measures conducive to broad restriction of the syndrome.

. . . A community programme for the control . . . of any morbid process, requires an initial reconnaissance by direct field survey (Gordon, 1963), an assessment of facilities and budget, and an estimate of the available personnel, professional and auxiliary. The designing of a programme is based on what is practical and possible rather than what is ideal, with added provision for the subsequent evaluation of the results attained. . . .

This paper has described the results of three comprehensive incidence investigations over a period of several years, one in India, one in the Arctic and one in Guatemala. From a world standpoint, comparable investigations in less developed areas of Africa and South America and in Asia would be useful. . . .

The present-day approach to the control of acute diarrhoeal disease has given too much emphasis to the obligations and duties of public health agencies, and little recognition to the fact that control depends to a great extent on individuals. The stress has been too much on what society should do for the individual and too little on what the individual must, of necessity, dofor himself, as good epidemiological evidence shows.

This is not disparage the constructive measures embodied in building privies, improving watersupplies, providing laboratory facilities, and pasteurizing milk. What is implied is that correction of faulty practices of personal hygiene, understanding of dietary practices and requirements, better command of maternal and child health procedure and elimination of cultural prejudices have special significance in restricting diarrhoeal disease in its most prevalent and most severe forms, the weanling diarrhoea of infants and small children.

. . . The argument is for equal attention to people and to things, to babies as well as to water. Both endeavours are within the range of recognized public health activities, since the improvement of personal hygiene by health education is definitely a function of health agencies. . . .

* INCAP Publication 1-317.

Descriptors (continued)

2) attack rates
deaths
malnutrition
mode of transmission

3) public health
education
medical care
sanitation
environment
control
epidemiological evidence
hygiene
dietary practices
cultural prejudices
weanling diarrhoea
health education

Disease/Solid Waste
Abstracts

No. DSW- 731

Author

G. J. Dammin

Title

The Pathogenesis of Acute Diarrhoeal

Disease in Early Life

Reference

WHO Bulletin

Doc. No.	**Contract No.**	**Date issued**
Bulletin No. 31, pp. 29-32, 1964		

Abstract

. . .In the study to be described, less than half of the patients with diarrhoeal disease had enteric pathogens of any type, alone or in combination. . . .

Only a summary of our findings and their implications can be presented in this report. Details are contained in reports to the Commission on Enteric Infections of the Armed Forces Epidemiological Board and in other reports to be published. . . .

In Table 2 are listed the recognized or presumed bacterial and viral pathogens isolated. In 48% of the cases with diarrhoeal disease, none of these agents was isolated. Few pathogenic protozoa were identified: there were three cases with Giardia lamblia and none with Entamoeba histolytica. Helminths were common in faecal specimens, but not in sufficient numbers to be considered the basis of idarrhoeal disease; nor could any of the observed helminthic lesions be regarded as having this implication.

A correlation of bacterial pathogens with diarrhoeal disease . . . shows that fewer cases had associated pathogens (23/50) than did not 27/50). . . . From our study of a group of five cases with malnutrition but without diarrhoeal disease (Table 1), we concluded that advanced malnutrition with jejunal and pancreatic acinar atrophy could obtain in the absence of diarrhoeal disease. In such cases, the jejunal mucosa showed no inflammatory response (Fig. 1). However, when diarrhoeal disease occurred with malnutrition, even in the absence of a specific pathogen, an inflammatory response was noted in the jejunal mucosa . . . .

. . . Our observations in Guatemalan children, among whom malnutrition is common, suggest that malnutrition may be one of the factors favouring high bacterial populations in the jejunum. . . . . . . in childhood malnutrition there

Descriptors

epidemiology
disease
diarrhoeal disease
enteric pathogens
pathogens
protozoa
Giardia lamblia
Entamoeba histolytica
helminths
faecal specimens
malnutrition
children
bacterial populations

Abstract (continued)

may be abnormally high bacterial populations in the jejunum, (b) that such populations may be the basis for mucosal inflammatory reactions of the type observed in cholera, and (c) that diarrhoea in malnutrition may result from abnormally large populations of bacteria not generally regarded as enteric pathogens. . . . Further studies are needed to determine whether the abnormally high populations of bacteria not regarded as enteric pathogens act directly on the intestine in inducing diarrhoea or whether an indirect mechanism involving anaphylaxis is responsible, . . . In either case, it is desirable to reduce the bacterial population in this - so often sterile - portion of the intestine, by the use of antibiotics in the short run, and by improving the patient's nutrition in the long run.

Disease/Solid Waste
Abstracts

No. DSW- 732

Author

Albert V. Hardy

Title

Diarrhoeal Diseases of Infants and Children

Mortality and Epidemiology

Reference

Bulletin World Health Organization

Doc. No.	Contract No.	Date issued
No. 21, pp. 309-319		1959

Abstract

The accuracy of mortality data in all countries is determined by the reliability of the original diagnoses. It must be acknowledged that diagnoses of the diarrhoeal diseases are chiefly symptomatic, and that mortality statistics can provide evidence only on a group of disorders in which the outstanding clinical manifestation is diarrhoea. In some countries from which vital statistics are available, it is evident that a significant proportion of the births and deaths of infants goes unrecorded. . . . In such areas, the mortality rates for specific diseases, as computed, will be only a fraction of the presumed total rate. Discrepancies will be marked for conditions primarily involving infants. Thus, available mortality data tend to understate the magnitude of the problem of diarrhoeal diseases for those countries with inadequate medical services and poor communications.

Mortality in the United States.

. . . Since 1930 there has been a slow downward drop toward the present level of two deaths per 100,000 population from all diarrhoeal diseases.

Mortality rates are available for few cities in the United States for years earlier than 1900. . . . In most, during the period from 1900 to 1930, there was a rapid decline from excessively high to moderately low mortality from these diseases. In general, rates for states as a whole were appreciably lower than in cities, since at that time the mortality from diarrhoeal diseases was generally less in rural than in urban populations.

At the turn of the century, mortality from diarrhoeal diseases was high everywhere in the United States. In some states, there was an early and rapid decline,

Descriptors

diseases
gastritis
enteritis
colitis
dysentery
salmonellosis
mortality
diagnoses
bacteriological surveys
immunological responses
meat
pets
planning
diarrhoeal diseases
deaths
infants
United States
geographical area
immigrants
migratory labourers
control
milk
flies
fingers
faecal comtanination
nutritional disorders
Canada
Americas
Europe
Asia,
Africa
Australia
gastro-intestinal diseases
infancy
food-borne epidemics
water-borne outbreaks
direct person to person spread
personal cleanliness
malnutrition
childhood
death rates
age-specific death rate
epidemiological aspects
faeces
summer diarrhoea
Shigella infections
community groups
hand-washing facilities
fly control
Salmonellosis
animals
birds
eggs

Abstract - continued

while in others there was a delay both in time and rate of fall. Thus, in later years the variation in mortality was great, ranging from high in a few states or territories to very low in many. . . .

Furthermore, in individual states there has been wide variation in different areas and in different population groups. Within the same geographical area, some segments of the population have little or no enteric disease, while in others the mortality from these causes may equal that which prevailed generally 50 years ago. In Hidalgo County, Texas, for example, from 1942 to 1945, the mortality rate for diarrhoeal diseases in permanent residents living under comfortable economic circumstances was 12 per 100,000 population, while it was approximately 400 in the families of recent labourer immigrants. Similar wide variations have been evident more recently in California between the general population and families of migratory labourers. In the United States, a major remaining problem is to provide effective control measures for diarrhoeal diseases in such scattered foci of high incidence.

The magnitude of the current problem in other countries of the Americas is indicated by the data in Table 1. Mortality rates for diarrhoeal disease are comparatively low only in the United States and Canada. . . .

In general, two major types of diarrhoeal disease are observed in children. First, there is the acute episode occurring in the previously normal, well-nourished infant or child. . . .

In many areas of Central and South American there is a second major group of diarrhoeal diseases. Presumably these are common in all economically underdeveloped areas. In the infants and children involved, there is obvious evidence of malnutrition and retarded development. . . .

Dairrhoea of the newborn is a third clinically distinctive type of diarrhoeal disease. It was recognized and studied as an epidemic disease in nurseries. . . .

Attention here will be confined to the two major types of disorders, primary infectious diarrhoeal disease and diarrhoeal disease associated with malnutrition.

The literature concerning dysentery and diarrhoea reveals wide differences in findings, opinions and teaching. . . . As economic, social and medical conditions improve, . . . the incidence of these diseases declines and the pressure for study is removed. This inverse relationship of need and opportunity for investigation largely accounts for the fact that studies of diarrhoeal diseases in areas of high prevalence are limited and wholly inadequate. These diseases obviously have not received the attention of medical scientists which their relative importance warrants.

Abstract (continued)

. . . Flexner & Holt made a detailed report of clinical and laboratory studies on hospitalized cases occurring in metropolitan centres of the north-eastern United States in 1903. . . . In a bacteriological study of 421 of these cases, 273 (66%) were positive for what was then known as the Shiga or Flexner bacillus or both. It may be assumed that the selective media now available would have increased the proportion of positive findings. These data provide strong historical evidence that the widely prevalent "summer diarrhoea" of that era was due predominantly to Shigella infections.

Field studies were conducted in New Mexico and Georgia by Hardy & Watt, beginning in 1938. . . . As compared with the severe cases described by Flexner & Holt, these were relatively mild illnesses. But these cases also predominantly had the characteristics of primary infectious diarrhoeal diseases. In this series of 517 cases, 76% of the severe and 58% of the milder cases were culturally positive for Shigella. . .

Thus in these studies performed in different periods and areas of groups of cases which had the clinical characteristics of acute infectious diarrhoeal disease, the most common cause was Shigella. . . .

Shigellosis

. . . Numerically the commonest human source for the spread of shigellosis is the totally asymptomatic and clinically insignificant infection. Bacteriological surveys of community groups in New Mexico provided the author with the following observations: "Of the 380 culturally positive persons encountered in these surveys, only two were under the care of a physician. . . . Thus, for every known infection (manifest source) there are numerous unrecognized infections (hidden source). . . .

There have been few long-term studies to determine the incidence of Shigella infection in affected groups. Floyd (1954), studying representative children in an Egyptian village, found that virtually every child acquired Shigella infection, with with or without symptoms, one or more times during the year. We have had similar findings in institutional populations (1954). These data, and the studies of prevalence in community and family contacts, lead to the impression that the total incidence of Shigella infection in groups in which it is endemic is very high.

Abstract (continued)

. . . when infants acquire Shigella infection, many or most become ill, often with severe disorders or even fatal illnesses. In most regions, at and after three years of age severe illnesses are uncommon., mild disorders are more frequent, and many infections are sub-clinical. . . .

There is no reliable evidence concerning the nature and significance of immunological responses to Shigella. . . .

Shigella discharged in human faeces may be disseminated in different ways. The main question is the relative importance of the various modes of spread. Milk as a means of introducing Shigella into homes, is relatively free of suspicion. Currently the cheaper and the sanitary canned and dehydrated milk is widely used by the poor, among whom diarrhoeal diseases are most common. Food-borne epidemics may occur but are unusual. Water-borne outbreaks have been reported but they also are rare. The two important modes of spread appear to be through flies and fingers. Shigella infections were reduced by about one-half in Hidalgo County, Texas by an effective programme of fly control (Watt and Lindsay. 1948). However, a relatively direct person to person spread of faecal contamination is probably the most important mode of dissemination of this infection. Thus personal cleanliness - and the availability of hand-washing facilities - plus fly control, are of high importance in the prevention of shigellosis.

Salmonellosis

That Salmonella may cause serious diarrhoeal disease in children is known, but the relative frequency of such infections is unknown. Limited data suggest wide geographical variations.

Here we are dealing with infections which have their natural habitat in animals and birds. Explosive outbreaks of food-borne salmonellosis have been recognized repeatedly. Eggs and meat have been incriminated frequently. Healthy domestic pets have been shown to be potential sources for the spread of these infections.

. . . the sources and modes of spread differ markedly. . . .

Enteropathogenic Escherichia coli Infections

There has been a slow and reluctant acceptance of the concept that coliform organisms may cause serious enteric infections in humans. . . . In nursery groups with diarrhoea of the new-born it has been found repeatedly that a high proportion of the coliform organisms in the faeces of affected infants were a specific type of E. coli. There were no comparable findings in nurseries free of disease, or in healthy infants in affected nurseries. . . .

The significance of these findings in explaining the continuing high prevalence of diarrhoeal diseases in many countries is unknown. . . .

Abstract (continued)

Viral enteric infections

It is accepted that enteric viruses may be the cause of diarrhoeal diseases in animals (Morse, 1956). . . . The common occurrence of viral agents in the faeces of primates, with and without diarrhoeal diseases, has been demonstrated. . . . That they have a role in some diarrhoeal disorders of the young is accepted. . . .

The present evidence concerning their significance in diarrhoeal diseases of humans is even more fragmentary. . . . The common occurrence of viral agents in the faeces of infants and children with diarrhoeal diseases has been demonstrated by Sabin & M. Ramos-Alvarez (Morse, 1956). However, while it may be accepted at present that a wide variety of viral agents invade the enteric tract, their significance in the production of diarrhoeal diseases is undetermined. . . .

Diarrhoeal Diseases and Nutritional Disorders

Laboratory studies in Guatemala have included examinations for Shigella, Salmonella, and for enteropathogenic strains of E. coli. Even so there were more cases of diarrhoeal disease with cause undetermined than of disease in which some presumed pathogenic agent could be demonstrated.

In planning intensive studies, a limited number of representative areas could be selected. . . . Co-ordinated planning to assure comparability of indings on a world-wide basis would enrich the studies in each area.

. . . there could, and should, be a research component in every administrative and control activity. . . .

The practical public health control of diarrhoeal diseases has not been solved satisfactorily. This problem stands challengingly before us.

Disease/Solid Waste Abstracts

No. DSW- 733

Author

Louis J. Verhoestraete, & Ruth R. Puffer

Title

Diarrhoeal Disease with Special Reference to the Americas

Reference

W.H.O. Bulletin

Doc. No.	**Contract No.**	**Date issuec**
Bulletin No. 19, pp. 23-51, 1958		

Abstract

In the Americas, as in other areas of the world, diarrhoeal disease is a major health problem to many of the countries. . . . In economically less-developed countries . . . death rates are still invariably very high. . . .

Diarrhoeal disease as considered here refers to the group gastritis, enteritis, etc., title numbers 543, 571 and 572 of the International Statistical Classification of Diseases, Injuries, and Causes of Death, Sixth Revision of International Lists, 1948 (World Health Organization, 1948). . . .

Study of the trend of mortality from diarrhoeal disease in six countries from 1920 to 1954 . . . reveals several important points. In the USA and Canada, where rates for all ages were high, rapid and almost continuous declines have occurred. In contrast, in Mexico, Venezuela, Colombia and Chile the trend of mortality from diarrhoeal disease for all ages has not shown a great decline. . . . The 1926 USA percentages were approximately the same in the first 5 months of life, followed by a decline; however, in 1953 deaths due to diarrhoea appear to show a greater concentration in early life. . . .

The frequency with which infectious agents responsible for diarrhoea disease can be found is dependent on the type of population groups studied, on the age of the persosn examined, on place, climate and season, and on the methods used, including the time of investigation in relation to onset of illness. . . . In hospital investigations in the past, Shigella and Salmonella have usually been found to be the principal etiological agents responsible for diarrhoeal disease.

Even with ideal techniques, however, etiologic agents have not been found for a large proportion of the cases, of which usually between 40% and 60% give negative results when tested for the causative organisms. . . .

Descriptors

Americas
diarrhoeal disease
death rates
disease
gastro-enteritis
diarrhoea
intestinal diseases
enteritis
North American
South American
Brazil
Mexico
Egypt
Guatemala
Colombia
Venezuela
Uruguay
Argentina
USA
Canada
etiology
epidemiology
population groups
Shigella
Salmonella
Escherichia coli
enteropathogenic E. coli
viruses
water-borne epidemics
water supplies
typhoid-fever
water use
prevention
dehydration
rehydration

Abstract (continued)

Lately the role of viruses in relation to gastro-enteritis has also received attention (Higgins). Although this question is far from being clarified, certain studies (Gordon and fellow-workers, 1953, 1957; Jordan et al), have dealth with the transmission to human volunteers of viruses from stool filtrates of patients suffering from epidemic diarrhoea. It is possible that a proportion of the cases of diarrhoea with consistently negative findings in previous studies could have been caused by E. coli and viruses, for investigations in the past did not include search for these agents.

The prevalence of Shigella and Salmonella has been determined in four community surveys of children (Beck et al; Floyd, 1954; Watt and fellow-workers, 1948, 1953) in California and Texas in the USA, and in Egypt and Guatemala (see Table II). All these studies were made in areas with high death rates from diarrhoeal disease, particularly in the two latter countries.

Shigella was found much more frequently than Salmonella in all areas, the highest proportion posotive being in Egypt and Guatemala (8.0% and 7.4%). Less than 1% were positive for Salmonella in these studies. Thus, of the agents investigated, Shigella seemed to be the important causative agent in these areas. Floyd (1954) reported that in Egypt the situation was much more serious at the height of the season, when as many as 25% of the swab cultures taken were positive for Shigella.

. . . data indicate that in early infancy - an age period with a high death rate from diarrhoeal disease - Shigella is not found as frequently as in later infancy and in childhood.

Further data of the incidence of the disease are provided by intensive follow-up studies in Egypt (Higgins et al 1955) and in New Mexico and Georgia. USA (Hardy & Watt, 1948); for these two states. Table IV shows morbidity rates among children under 10 years of age. The highest rate was in children 1 year of age, with approximately one case per child per year. It should be stressed that the incidence of the disease, as well as the prevalence, was less in children under 1 year of age than in older children. The infectious agent (Shigella) was found in only 30% of the cases of diarrhoeal disease. The estimated incidence rate on a yearly basis was much higher in the Egyptian study - namely 2.8 cases per child; here again, however, only one-third of the cases were associated with Shigella. The lower prevalence and incidence of Shigella infection in the group aged under 1 year raises questions regarding the underlying mechanisms determining spread of disease.

Mechanisms of Spread and Methods of Prevention

Data available from mortality statistics and from morbidity studies are valuable for understanding some of the factors responsible for the spread of gastro-intestinal diseases and determining methods of prevention.

Abstract (continued)

. . . The decline in typhoid-fever rates has been attributed principally to this purification of the water supplies. Johnson, as quoted by Horwood (1932) analysed the average typhoid-fever death rates in 20 large cities for the 5 years before and the 5 years after the introduction of filtration, and found a 65% decrease.

. . . Epidemics of diarrhoea caused by defective water supplies were known to occur and do still occur . . .

The Manual of the American Water Works Association Water Works Practice, provides data regarding the annual typhoid-fever death rates for 19 large cities, giving the dates when filtration or sterilization became effective for the entire city. For 16 of these cities data regarding deaths due to typhoid fever and to diarrhoea and enteritis were obtained from the United States Bureau of the Census volumes on mortality statistics for 1900-1920. In all 16 of these cities filtration or sterilization was introduced during this period, the first occasion being in 1906; in 1913, 13 cities had established complete filtration or sterilization, and by 1918 all 16 had done so. The total population of these cities was approximately 12 million in 1920.

The decline in the typhoid-fever death rate from 40.5 per 100,000 population at the beginning of this period to 3.6 per 100,000 in 1920 . . . represents a reduction of 91%. . . . in 1900 the death rate from diarrhoea and enteritis was 134.4 per 100,000 population, and although variations occurred it remained relatively high until 1910. However, in the latter part of the period some decline was noted and in 1920 the rate was 74.7 per 100,000 population, showing a 44% reduction during the period when the typhoid-fever death rate was reduced by 91%. Study of the death rates from diarrhoeal disease in infancy and childhood revealed that although variations occurred, the rates in infancy remained relatively high until 1919. Therefore, during this period improvement of the water supply did not show the same influence on mortality from diarrhoeal disease as on that from typhoid fever. We can infer that improvement of the quality of water was really responsible for the decline in mortality from typhoid fever, since immunization on a community basis had not been introduced and no new methods of treatment were established that could have markedly influenced mortality. However, qualitative improvement of water supplies did not play a major role in the decline of diarrhoeal disease during that period.

Effect of availability of water

Recent evidence from morbidity studies indicates the importance of increased availability of water as a single factor in lowering Shigella prevalence and incidence. In a study by Watt et al (1953) in Fresno County, California, the prevalence of Shigella was obtained in four groups, according to economic status and water supply. The prevalence of this organism showed a progressive fall from those with poor housing without indoor plumbing to those of the low economic status with water in the house. . . . According to the authors ". . . data suggested that modification of a single environmental factor, water use, may significantly lower Shigella prevalence when the risk of acquiring this infection is great."

. . . In terms of a practical programme, a systematic search for one or more

Abstract - continued

specific sources mainly responsible for the great increase in fly-breeding should be carried out and fly-control campaign aiming at reduction of the fly population from such sources might eventually rpove to be highly successful.

The second line of emphasis combines some specific measures aimed at making the immediate environment of the child safer, particularly in terms of food. In this approach, even the protection of food from flies through use of a simple storage case with screening might prove very valuable. . . . The data presented show strikingly the protective value of breast-feeding in poor environmental circumstances. . . .

Disease/Solid Waste
Abstracts

No. DSW- 734

Author

Healy, W.A.; R. P. Grossman

Title

Typhoid is Still Water-borne

Reference

Water Works Eng.

Doc. No.	Contract No.	Date issued
Vol. 114, p. 38	Jan. 1961	

Abstract

. . . conditions which led to the waterborne typhoid incident: . . .

(1) A logging camp was located on the upper watershed of a pond which supplies the city with drinking water. . . . Exposed human excreta was piled where rain could carry it to the receiving stream.
(2) A heavy rainstorm greatly increased the run-off from the water-shed.
(3) The slow sand filters receiving raw water from this watershed had been cleaned the day previous to the high run-off, a situation which evidently resulted in a lessening of effectiveness in bacterial removal.
(4) Finished water chlorination was not provided.

This unfortunate and tragic series of events . . . in addition to the sick boy, affected 13 other water consumers, one of which died. . .
. . . the threat of intestinam water-borne disease is still very much a realty. . .

Descriptors

typhoid
water supply
watershed
human excreta
chlorination
intestinal water-borne disease

Disease/Solid Waste
Abstracts

No. DSW-735

Author

T. Wayne Downey

Title

Polioviruses and Flies: Studies on the Epidemiology of Enteroviruses in an Urban Area

Reference

Yale Journal Biol. and Med.

Doc. No.	Contract No.	Date issued
Vol. 35 (4), pp. 341-352		1963

Abstract

The present study was undertaken in an attempt to define more clearly the association of enteroviruses and flies. . . .

The findings of the present study illustrate the relative ease with which poliovirus may be recovered from flies during an urban epidemic of poliomyelitis. The presence of virus in flies seemed to serve as a fairly consistent mirror of the level of clinical disease in two areas of this urban population. . . .

. . . the circulation of poliovirus vaccine strains, administered several months earlier in the study area, was not sufficient to be reflected in contamination of flies.

The absence of enteroviruses in flies trapped during the summer of 1960 is in contrast to the findings reported for Guadalupe Village, Arizona[16], where at a time when no clinical disease was present (and very few poliovirus infections) a high percentage of fly catches yielded not only polioviruses but Coxsackie and ECHO viruses as well. The study areas in both New Have and Guadalupe Village contained a high density of young children who are known to be the best spreaders of enteroviruses, but the two sites differed markedly in their standards of sanitation: in New Haven, these were good, while in Guadalupe Village they were extremely primitive. In the latter site, because of the accessibility of human feces, relatively few excretors of virus could contaminate a large number of flies. In an urban area such as New Haven, on the other hand, where fecal material is disposed of in the sewage system, it is likely that virus could be recovered from flies only in the presence of infection of epidemic or near epidemic proportions.*

. . . It has been postulated that once flies are contaminated, they might serve more or less as accidental, mechanical vectors, particularly in tropical areas of

Descriptors

poliomyelitis
enteroviruses
urban
ECHO viruses
human feces
virus multiplication
virus
vaccine
population
children
vectors
endemic strains
flies
disease
Coxsackie viruses
sanitation
mutation

Abstract (continued)

low sanitation and high poliovirus endemicity. A more important role has, however, been suggested by the findings of Gudnadottir that some virus multiplication can occur in flies.[12] . . .

Summary

During two successive summer periods fly collections from four urban housing projects in New Haven, Connecticut were tested for the presence of enteroviruses. In the first summer an epidemic of poliomyelitis occurred which centered in the population of several of these areas. It was found that poliovirus type I strains, with genetic characteristics similar to strains isolated from patients, could be recovered regularly in areas with a high degree of poliovirus infection as manifest by clinical disease. The converse relationship was noted in the second summer of the study when no clinical disease due to enteroviruses occurred in New Haven and no enteroviruses were recovered from flies. Furthermore, there was no evidence in terms of virus isolations from flies of persistence of oral poliovirus vaccine strains which had been given to some of the preschool children of the area during February to May of 1960, although sewage specimens collected at the same time as flies did yield a few strains of poliovirus and non-polio-enteroviruses. These findings may indicate that in an area of relatively high sanitation a high level of infection must be present before flies become contaminated with enteroviruses.

*The importance of sanitation in relation to virus contamination of flies has also been documented recently in a study carried out by members of this Department in a village in Costa Rica, where it has been observed that the number of enteroviruses recovered from flies was related to the socio-economic standards of a given group as reflected by the cleanliness and sanitary arrangements in their houses.[11] The lower the socio-economic area in which the flies were caught, the more enteroviruses were recovered, while in "clean" areas of the same village few or no isolations were made from flies.

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Disease/Solid Waste
Abstracts

No. DSW- 736

Author

Title

California Waste Management Study

Aerojet-General Corporation

Reference A Report to the State of California Department of Public Health - Contract No. 347

Doc. No.	Contract No.	Date issued
Report No. 3056 (Final)		Aug. 1965

Abstract

A general classification of refuse materials is presented . . . to indicate the composition and source of this waste. . . .

Agricultural solid waste consists primarily of tree cuttings, manure, waste fruit or vegetables, and plant stalks. . . . No values are presented herein because of this wide variability.

Garbage is organic animal and vegetable materials discarded by households and businesses. The time lag between production and disposal is generally long enough to present serious aesthetic problems as well as serving as a possible health hazard.

The principal effect of this factor is in feeding and harboring vectors (rats, flies, etc.) which can transmit disease. Also, health is endangered if there is direct contact with bacteria-infested matter or if, in polluting the land, garbage also pollutes the raw water supply, either by percolating into the ground water or by contaminating surface streams. . . .

Organic animal and vegetable wastes . . . to the extent that they are discarded, . . . present an extremely attractive harborage for vectors. . . .

. . . organic chemicals can be a serious threat if they are not closely controlled. On-site poisonings, widespread damage to plant and animal wildlife, and residual ingestion and accumulation in the human body are endemic problems in many areas. Because of the persistence and demonstrated toxicity of these compounds to plants and animals, they are among the most intractable of land pollutants. Standards are extremely vague, ...

A conflict between standards of public health and environmental conservation and the need for pest and weed control has become apparent. . . . No one knows the true effect of prolonged ingestion of agricultural chemicals on man or other animals . . . .

Descriptors

solid wastes
waste
classification
components
sources
agricultural wastes
manure
waste waters
oilfield waste waters
refuse
municipal refuse
taste
odor
pollution
rubbish
organic wastes
chemical wastes
excrement
animals (dead)
radioactive pollution
radioactive wastes
osmosis(reverse)
control
incineration
grinding
composting
landfill
salvage
disposal(waste)
ocean disposal
garbage
hogs
standards
water treatment
costs
gaseous waste
sewerage
budget (solid waste studies)

Abstract (continued)

. . . The roster of diseases communicated by contact with excrement is long; . . .
Where large concentrations of animal excrement accumulate - for example, on dairy farms or chicken ranches - the possibility of external social costs leading to the underutilization of neighboring land arises. These social costs include disease as well as unaesthetic conditions. . . .

Dead animals present special problems. . . .

METHODS OF CONTROLLING SOLID WASTE

Incineration
Grinding Into a Sewer
Household Composting
Landfill
Salvage
Ocean Disposal
Feeding Garbage to Hogs

Disposal of Solid Radioactive Wastes

Solid Source Standards

The Water Pollution Control Board for Region 4 (Los Angeles and Ventura Counties) established objectives (in Resolution 55-1) for preventing and controlling water pollution with respect to disposal of solid waste in the Los Angeles area. . .

Solid waste problems have been given much less attention. However, nine representatives introduced identical bills into the House this spring to support research on solid waste problems. . . .

Solid Waste Subsystem

The solid waste management problem is not particularly severe in the Sacramento area. The sectional characteristics, waste loading expected, and alternate methods of handling are presented in the following sections more to provide information than to indicate the need for immediate action. A few items indicate a need for some concern . . . .

Disease/Solid Waste
Abstracts

No. DSW- 737

Author

Title

Circulation - Cadmium & Blood Pressure

Reference

Time

Doc. No.	**Contract No.**	**Date issued**
p. 61		Nov. 4, 1966

Abstract

. . . if he was right, Dr. Henry A. Schroeder . . . provided an explanation for millions of hitherto inexplicable cases of high blood pressure. . .

. . . Dr. Schroeder first drew attention to a puzzling association between the softness of the drinking water in an area and the frequency of hardened arteries among men who live there. . .

. . . From the start, Dr. Schroeder did not believe that the growing incidence of arterial disease reflected the presence of such common and nautral drinking-water constituents as calcium bicarbonate, with which man has lived throughout history. What concerned the imaginative researcher was pollution by metals that modern man, the metallurgist, now scatters around him profusion.

. . . Among the 20 elements that Dr. Schroeder investigated as potential artificial pollutants, cadmium produced the most striking results. Rats given minute traces of cadmium salts in drinking water all their lives developed high blood pressure of a type remarkably similar to the human disease. . . . . the animals developed fatty plaques in their aortas, and showed enlargement of the heart. When rats receiving cadmium were divided into two groups, 80% of those on soft water developed high blood pressure as against 17% of those on hard (calcium-containing)water. When the animals were treated with a drug that substituted zinc for the cadmium already in their tissues, blood pressures returned to normal.

The next question was obvious: Do humans react like rats when they ingest cadmium and other metals? . . . Dr. Schroeder offered chemical analyses of 400 human kidneys showing that Americans at birth have a negligible amount of cadmium stored there, that the amount of the metal increases gradually with age and reaches its highest levels in patients with high blood pressure of unknown origin. . . .

Descriptors

water
arterial disease
drinking-water constituents
calcium
metals
metallic contamination
pollutants
cadmium
rats
high blood pressure
kidneys
kidney function
soft water
hard water
chromium
diabetes
atherosclerosis

Abstract (continued)

Civilized man, said Dr. Schroeder, ingests an excess of cadmium from tea and coffee, refined flour and polished rice, some phosphate-fertilized crops - and water pipes. Soft water, he declared, takes up cadmium, a contaminant in copper and galvanized pipies, far more readily than does hard water.

Chromium Decline. Another of the 20 elements studied was chromium. All over the world, people are born with relatively generous amounts of chromium in their vital organs, but in the U. S. the levels decline precipitously around age ten. By juggling his rats' intake of chromium, Dr. Schroeder found that a severe shortage, such as afflicts many adult Americans, caused many of the rats to develop first diabetes and then artery disease - a condition remarkably like progressive human diabetes. With animals kept at what Dr. Schroeder considers a normal chromium level, there was virtually no diabetes or atherosclerosis. . . .

Cautiously, Dr. Schroeder pointed out that he was not simplistically laying all the blame for high blood pressure and atherosclerosis on cadmium and chromium. Other exotic elements such as vanadium, zirconium and niobium, all "abundant in the human body", influence thelevel of fats in the blood. And these, said Dr. Schroeder, are metals to which newly exposed man has little or no ability to adapt.

Disease/Solid Waste Abstracts

No. DSW-738

Author
H. M. Perry, Jr., I. H. Tipton,
H. A. Schroeder, and M. J. Cook

Title
Variability in the Metal Content of Human
Organs

Reference
J. Lab. Clinical Med.

Doc. No. **Contract No.** **Date issued**
Vol. 60, pp. 245-253 1962

Abstract

The concentrations of the essential metals: magnesium, calcium, manganese, iron, copper, zinc, and molybdenum in human organs were found to be more constant than the concentrations of the presently nonessential metals: strontium, barium, aluminum, titanium, vanadium, chromium, nickel, silver, cadmium, tin, and lead. For the former the 80% range of concentrations for each metal in each organ, expressed as ninetieth percentile/tenth percentile, was usually less than 3.5 and almost always less than 7.0. For the latter the ranges were usually greater than 7.0 and often greater than 14. These ranges were equally valid for liver, kidney, lung, aorta, heart, spleen, and brain of 150 healthy adults who died suddenly and unexpectedly in the United States. The ranges for the same organs of 100 adults, many of whom were chronically ill, from 8 different parts of Africa, Asia, and Europe were similar but somewhat larger. The two populations were more alike with respect to the absolute concentrations of essential than of nonessential metals. In both populations aluminum and titanium were strikingly accumulated in the lung and cadmium in the kidney.

Nine chemical elements which occur in concentrations greater than one part per thousand comprise over 99 per cent of protoplasm. Nine more elements which occur in smaller concentrations are known to have specific biologic functions. These 18 elements are designated essential. At least a score of additional elements are also present in small but measurable concentrations in many mammalian tissues. They are currently designated nonessential since they are not now known to be required for any biologic function.

Descriptors

metal
essential metals
magnesium
calcium
manganese
iron
copper
chronically ill
chemical elements
human organs
zinc
molybdenum
organs
nonessential metals
stronium
barium
Europe
aluminum
titanium
vanadium
chromium
nickel
silver
cadmium
Africa
tin
lead
range
concentrations
liver
kidney
lung
Asia
aorta
heart
spleen
brain
healthy adults
United States
adults
populations

Abstract (continued)

Large and unexpected differences in the concentrations of individual metals in human organs have recently been observed.[1,2] In seeking associated phenomena, a study was made of several variables, including the subjects' geographic origin, age, sex, race and disease. Despite shortcomings, both in the techniques of collection and in the methods of analysis, some striking correlations between the first two of these variables and metal concentrations were found, such as those reported for renal cadmium.[3]

. . . The greater upper limits of concentration that were found for most nonessential tract metals among foreign as compared with American subjects may reflect the chronic illness of the former, but more probably it reflects their wider exposure to unusual environmental conditions associated with their wider geographic distribution.

The apparently universally high pulmonary concentrations of aluminum and titanium in adults may well occur because these metals enter the body predominantly via the respiratory tract where they are immobilized. By analogy with equine kidney[6], it seems likely that the renal cadmium is strongly bound to a protein, but the underlying reasons for the predilection of this metal for kidney remain unexplained. Finally, the arbitrariness of the distinction between essential and nonessential metals must be re-emphasized. Chromium, with its effect on glucose metabolism[7], seems particularly likely to be transferred from the nonessential to the essential category. Varadium, which is essential in some protovertebrates and which increases both phospholipid[8] and monamine oxidation[9] in mammalian tissues, is another cadidate for such a transfer from non-essential to essential.

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Disease/Solid Waste
Abstracts

No. DSW- 739

Author

Title
Post-Attack Sanitation Waste Disposal,
Pest and Vector Control Requirements
and Procedures

Reference

Engineering Science, Inc.

Doc. No.	Contract No.	Date issued
p. 123		Feb. 1965

Abstract

. . . probability . . . 14 diseases . . . enteric infections (shigellosis, infectious hepatitus, salmonellosis, typhoid and amoebiasis), . . . need for the prompt removal and sanitary disposal of human feces and of spoiled food and other decomposable fly breeding potential organic material. . . . mosquito-borne encephalitis, rabies, murine typhus, plague, leptospirosis, rocky mountain spotted fever, dengue, malaria . . . yellow fever. . . .

Descriptors

diseases
vectors
wastes
disposal
sanitary engineering

Disease/Solid Waste
Abstracts

No. DSW- 740

Author

Herzog, W. T.

Title

Emergency Health Problems Study

Reference

Research Triangle Institute

Doc. No.	Contract No.	Date issued
		July 1963

Abstract

This study investigated the effect of medical care and public health measures on the number of persons surviving nuclear attack. Each activity could add a maximum of two percent of the pre-attach population to the surviving population.

The death rate due to disease and non-attach injury (excluding extremely adverse shelter environments) would probably not exceed one percent of the population, even if no medical care were provided. This is because of the relatively slow spread of epidemcis in their early stages, the generally short period of shelter confinement and the peacetime health status of the population.

Public health personnel could limit disease by acting to maintain sanitation and instituting epidemic control procedures.

Although epidemics of diseases which cause limited fatality will occur in a few isolated shlters, the overall number of deaths due to disease during the shelter period will probably be less than one percent of the total population. Enteric diseases will affect the majority of occupants in shelters that have grossly inadequate sanitation facilities.

Barring the use of biological warfare agents, the combined impact of exotic diseases can be expected to be relatively insignificant during the shelter period. This is due to the small incidence of these diseases among the peacetime population and to the fact that the constraints on mobility will tend to confine the outbreaks that do occur to a limited number of shelters.

Descriptors

warfare
nuclear warfare
casualties
disease
shelters
health
environment
medical care
radiation
infection
injuries
statistics (health)
stockpiling

Disease/Solid Waste
Abstracts

No. DSW- 741

Author

Ayres, R. U.

Title

Special Aspects of Environment Resulting

from Various Kinds of Nuclear Wars

Reference

Hudson Institute Inc. HI 243 RR

Doc. No. **Contract No.** **Date issued**

Abstract

This study discusses types of thermo nuclear attacks and their impact on the environment, including direct and indirect effects on man, animals, and plants. Nutritional and other requirements in the post-attack period are discussed as are diseases most liable to occur in this period. Thermonuclear attack effects on weather and extension of these effects on biological processes are considered, including forests and soil and water conservation.

Recommendations are given with regard to study programs and action programs to extend knowledge of and preparation for attack effects.

Descriptors

warfare
thermonuclear warfare
nuclear attack
radiation
food & food chains
nutrition
exosystems
crops
animal disease
domestic animals
agriculture
insects
vertebrates
nuclear warfare
weather
water
soil
human disease
forests
disease
bacteria
rickettsia
viruses
protozoa
pathogens
plant disease

Disease/Solid Waste
Abstracts

No. DSW- 742

Author

Paul C. Beaver and Thomas C. Orihel

Title

Human Infection with Filariae of Animals in the United States

Reference

Am. J. of Tropical Medicine and Hygiene

Doc. No.	Contract No.	Date issued
Vol. 14 No. 6, pp 1010 - 1029		1965

Abstract

Information on human infection with *Dirofilaria* was reviewed by Faust in 1957 [1]. At that time thirty-seven cases had been reported from various parts of the world, four from the United States. More recently, six cases were reported from Florida[2-5] and one each from Michigan [6], Washington[7], Massachusetts[8], Louisiana[9], Texas[10], and Wisconsin[10]. Filarial worms of a different type were removed from persons living in Louisiana[11] and New York [12]. Altogether, the cases of filariasis reported as such from the United States now total eighteen.

The present report adds twenty-one cases - four that were misdiagnosed when previously reported and seventeen on which no report has been published. . . .

Among the filarial worms removed from patients in the United States, six distinct types can be recognized; Most common is the *Dirofilaria conjunctivae* type found in subcutaneous nodules. A second type, found in the heart and lungs, apparently is the common heartworm of dogs, *Dirofilaria immitis*. . . .

. . . zoonotic filariasis in the United States, at least the *Dirofilaria* infections, are mosquito-transmitted, . . .

In 1957[1] the number of human infections with *Dirofilaria* reported from all parts of the world was thrity-seven. According to O'Grady et al[13] the number had increased to about 44 in 1962. At present approximately half of the known cases have occurred in the United States. . . .

Descriptors

animals
Dirofilaria
filariasis
human infection
United States
worms
Dirofilaria conjunctivae
heartworm
dogs
Dirofilaria immitis
zoonotic filariasis
mosquito

References

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Disease/Solid Waste
Abstracts

No. DSW-743

Author
U.S. Public Health Service

Title
Drinking Water Standards, 1961

Reference
J. Amer. Water Works Association

Doc. No.	Contract No.	Date issued
Vol. 53 No. 8 p. 935 - 45		Aug. 1961

Abstract

Drinking Water Standards, 1961, U.S. Public Health Service

A report of the Advisory Committee on Revision of USPHS 1946 Drinking Water Standards. The revised standards included in this report have been approved by the Secretary of Health, Education and W lfare, and published in the Federal Register as the first step in the final approval routine.

Descriptors

drinking water
standards
US Public Health Service
source
protection
bacteriological quality
physical characteristics
chemical characteristics
radioactivity
analytical methods

Disease/Solid Waste
Abstracts

No. DSW-744

Author

Roger P. Scovill

Title

Mosquito Control in an Industrial Waste Lagoon

Reference

J. Water Pollution Control Fed.

Doc. No.	Contract No.	Date issued
Vol. 35 pp 663-8		May 1963

Abstract

The objective of the studies . . . is of a dual nature. The first is to enable disposal of wastewater in a manner devoid of nuisance conditions resulting from insect propogation or due to objectionable odors, ...

Investigation of control of mosquito larvae using . . . "Baytex" was begun in 1961. Basically these tests resolve into two procedures, (a) control of larvae existing in an area of standing water, and (b) prevention of development of larvae from a dry lagoon area when flooded with wastewater, . . .

. . . it was concluded. . . that effective control could not be obtained over the entire lagoon at insecticide concentrations less than 0.5 ppm when a mosquito larvae infestation of standing water existed.

Conclusions

For mosquito control in an industrial waste lagoon containing dense, emergent vegetation, and irrigated with water containing organic material, disolved and suspended solids, etc., the use of Baytex at 0.2 ppm, active ingredient basis, will prevent emergence of mosquitoes for up to 14 days over 6.7 acres of area with the insecticide added into the influent, ...

Descriptors

wastewater
mosquito
control
industrial waste
lagoon
insect propogation
vegetation
insecticides
mosquito larvae
odors
larvae
waste

Disease/Solid Waste
Abstracts

No. DSW- 745

Author Proceedings of 1961 Symposium
Taft Eng. Center, Cincinnati, O., 5-7 April 1961

Title
Ground Water Contamination

Reference U.S. Dept. HEW, PHS Bur. of States Services, Div. Water Supply & Pollution Sanit.

Doc. No. TR W61-[illegible]
Contract No.
Date issued 1961

Abstract

Topics (General):

- Symposium Objections
- Hydrogeological A pects of Ground Water
- Types of Contaminants
- Specific Incidents of Contam. in G.W.
- Regulations and Their Administration
- Research on G.W. Contaminants
- Program Participants

This publication provides an excellent summary of the major aspects of the subject.

Descriptors

groundwater
pollution
contamination
health
disease
geology
law
administration
research
housing
regulations
water quality
wells
ponds
lagoons
wastes
chemicals
industry
gas
bacteria
pathogens
viruses
refuse
disposal
typhoid
cholera
dysentery
tuberculosis
hepatitis
toxins
radionuclides

Disease/Solid Waste
Abstracts

No. DSW- 746

Author

Henry A. Schroeder

Title

Possible Relationships Between Trace Metals and Chronic Diseases

Reference

Metal-binding in Medicine, ed. by M. J. Seven.

Doc. No. **Contract No.** **Date issued**

Lippincott, 1960.

Abstract

The trace metals found in man may be divided into four groups: (1) metals considered to be essential for mammals, in that requirements for growth have been established, deficiency states discovered, or essentiality inferred as cofactors for certain purified metalloenzymes-manganese, cobalt, copper, zinc and molybdenum; (2) metals ubiquitous in plant and animal tissues with suspected metabolic functions but with essentialities unproven-rubidium, boron, barium, strontium, vanadium, chromium, nickel and aluminum, (3) metals without known functions believed to be contaminants-silver and lead; and (4) metals usually not detected in infants but apperently acquired and accumulated as environmental contaminants-cadmium, tin, titanium and, in some locations, bismuth, gold and gallium (rarely).

Those showing affinities for a specific tissue and accumulating in relativity high concentrations are cadmium in kidney and liver, aluminum, vanadium and titanium in lung; barium and strontium in bone, tin in intestine.

...Some metals first appear in childhood and accumulate during the next decades. While some of these metals may be inert or may occur in such traces as to be inactive, metabolic activities in vivo or specific enzymatic alterations in vitro have been shown for several, and overt toxicityes for a few. Therefore, it is tempting to speculate that...eventual breakdown of a metabolic pathway would result in a chronic disease. But...in only a few chronic disorders can metals be implicated as causative factors.

All necessary trace elements come from soil. All trace metals essential for terrestrial animals come from plants. ...It is unlikely (but not impossible), that a trace metal not present at birth is acquired later to fulfill an essential function.

The following postulate appears reasonable: Any element not present in plants is not essential for man. As a corollary, any element found in man but not in plants is an environmental contaminant.

Descriptors

humam tissues
mammals
plants
Metalloenzymes
deficiencies
research
Rheumatoid Arthritis
scleroderma
contaminants
metals
environmental
enzymes
toxicity
cancer
Collagen Diseases
metabolic activities
disease
soil
contaminant
ribonucleic acid (RNA)
Atherosclerosis
alergies
Hypertension

Abstract (continued)

...Ag and Au are not found usually in plants and may be classified as environmental contaminants. ...while Sn, Cd, Hg, Pb and Bi are probable contaminants.

Metalloenzymes are being discovered at an increasing rate.... Many enzymes depend upon manganese.... At least one is cobalt dependent. The copper oxidases are well known. Six mammalian zinc metalloprotiens have been isolated.... There are two mammalian molybdenum enzymes.... ...Titanium inhibited the oxidation of cysteine to the corresponding sulfonic acid.

Vanadium...and strontium have caused marked stimulation of mineralization of bone and teeth in animals and prevented caries.

...Various metabolic actions strongly infer, but do not prove, the essentiality of vanadium for man.

Chromium...Aside from obvious toxicity as chromates, little is known of its functions in the body.

Nickel...is apparently toxic only in industrial exposures....

Boron, essential for plants and present in man, has no known activity in mammals.

Aluminum...has been suspected to be essential.

Wacker and Vallee (21) showed that ribonucleic acid (RNA) from plant and animal sources contained chromium, manganese and nickel in constant amounts and believed that the association was significant. (Zn, Cu, Sr, Ba, Ca, Mg, and Al also were found).

Soils and plants deficient in one or more trace elements are well known. Deficiencies can be transmitted to livestock grazing on grasses and, thereby, presumably to man. Many soils of the world are deficient in molybdenum, copper, boron, cobalt, manganese or zinc.

If essential metals form complexes, it is probable that "abnormal" or contaminating metals also do.

Close competition by metals for ligands usually is a vertical series of displacements according to the Periodic Table and follows certain well-defined laws.

1. If an unknown metalloenzyme system is exposed to diminishing concentrations of many metals in various valence states, and if only one or two in the same periodic group or with the same characteristics for forming chelates inactivate that enzyme, one may be able to predict the natural metal.

Practical Considerations of Close Competitions and Possible Chronic Diseases

It is impossible to apply these considerations to clinical states at this time. However, one can exclude several competitions. High concentrations of a metal in a tissue place it under suspicion if the concentration approaches or exceeds that of an essential metal with the same characteristics.

All experimental studies on cadmium have shown evidence of toxicity and renal and hepatic accumulation.[23] It is an inhibitor of several mammalian enzymes....

. . .In vitro, some transitional metals will substitute for an essential one on an enzyme, with change of activity, but the significance in terms of disease is largely unknown. The V, Cr and Mn activities on hepatic lipid synthesis may be an example. . . .

Abstract (continued)

Little is known about the other metals found in human tissues: aluminum, tin, lead and bismuth. There are extensive data on lead toxicity: "permissible limits" showing no overt effects have been established for human beings; . . . Tin is toxic for animals only in large amounts; . . . Bismuth is toxic to animals in relatively large amounts, . . . Direct aluminum toxicity is not known . . .

Areas in which populations unexposed to modern civilization can be studied are fast disappearing, and chronic diseases are moving in. Therefore, it is hard to obtain demographic data on abnormal trace metals. Much basic experimental data is required before metals can be implicated as causes of specific diseases.

There have been several reports on the relationship of tissue metal levels to sarcomata and carcinomata. (47-49). Whether these changes are cause or effect is unknown. . . .

Rheumatoid Arthritis and Other "Collagen" Diseases

While most of the drugs affecting these diseases are metal-binding agents . . . no direct relationship has been established between metals and disease . . .

Allergies

Late toxic drug reactions are often produced by metal-binding drugs.(6). This curious coincidence deserves investigation

Hypertension

A trace metal imbalance is deduced from the indirect evidence (a) that all antihypertensive agents not acting on nerves appear to be metal-binding agents . . .

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Disease/Solid Waste
Abstracts

No. **DSW-**747

Author

Ernest L. Wynder, M.D.

Title

Environmental Causes of Cancer in Man

Reference

Med. Clin. North America

Doc. No.	**Contract No.**	**Date issued**
Vol. 40, pp. 629-45		May 1956

Abstract

The cause of cancer has puzzled man for generations. To our present knowledge there is no single cause. . . . No presently known factor can be regarded as "the" cause of cancer, but only as "a" cause. It is the purpose of this communication to summarize these causes of cancer in man, bearing in mind the limitations of "cause" as just delineated. . .

Data relating industrial factors to human cancer are based essentially on statistics indicating a higher rate of certain cancers in given industrial groups.... In most instances these factors contribute to only a relatively small number of cancer deaths. It cannot be said whether all of these factors are to be regarded as carcinogens per se or whether they function as co-carcinogens. . . . . . . as long as they increase the risk of causing a given cancer it is of only academic importance whether they are carcinogenic or co-carcinogenic, since with their removal or reduction a decrease in a given cancer rate can be expected.

Through epidemiologic techniques, . . . it has been repeatedly shown that the greater the exposure to certain specific environmental factors, the greater the risk of developing certain types of cancer. . . .

Environmental factors play a significant role in the production of may types of human cancer.

Only by studying all possible environmental factors for a given cancer can it be determined which factors are of primary, secondary or no etiologic significance.

Descriptors

cancer
history
industrial factors
carcinogens
co-carcinogens
tobacco
alcohol
environmental factors
nutrition
smegma
sunlight
radiation
animal experimentation
research
epidemiologic techniques

Disease/Solid Waste Abstracts

No. DSW-748

Author

N. Litvinov

Title

Water Pollution in the USSR and in Other Eastern European Countries

Reference

W.H.O. Bulletin

Doc. No.	**Contract No.**	**Date issued**
Bull. No. 26, pp. 439-463		1962

Abstract

Union of Soviet Socialist Republics

Research

A large number of research institutions and field services (some hundred in all) are engaged in research on problems of water hygiene and pollution, and it is not possible in the present paper to enumerate them all. Research is being done by ten institutes of hygiene, at all departments of hygiene of medical institutes (there are upwards of 80 such higher medical teaching institutes in the USSR), and at sanitation and epidemiological stations. Further, many technical, chemical, biological, hydrochemical, hydrogeological, planning and fishery institutes, as well as the water-supply and sewage departments of higher educational institutions and universities, water-supply laboratories and so on, are co-operating in such research.

Here, only a few specific problems selected from among the most important being studied by institutes of hygiene can be mentioned.

1) River pollution . . .

2) Condition of rivers with regulated flow, and reservoirs: measures for protection against pollution . . .

3) Hygienic assessment of composition and quality of ground waters: measures for their protection against pollution.

4) Drinking water standards: particularly with regard to chemical requirements.

5) Maximum permissible concentrations of noxious substances in sources of water supply into which sewage is discharged.

6) Utilization of waste waters for agricultural irrigation purposes.

Descriptors

Easter European Countries
water bodies
USSR
Czechoslovakia
Poland
Bulgaria
Romania
population
area
physical features
rainfall
rivers
industry
water supply
sewerage
surface
ground waters
legislation
water resources
research
pollution
standards
maximum permissible concentrations
carbonated
iodine
Bulgaria
chemical content
hardness
salts
iron
manganese
nitrites
nitrates
fluorine
sulfates
Poland
chlorides

Abstract (continued)

7) Evaluation of effectiveness of new methods and equipment in the purification and disinfection of drinking-water and of industrial effluents.

8) Regulations and standards governing the discharge of effluents into rivers.

Czechoslovak Socialist Republic

. . . The Palaeozoic ground waters are chemically, for the most part, sulfate waters, with a total solid content of up to 3000 mg/l; waters from the chalk deposits are mainly carbonated with a solid content of 200-700 mg/l; waters from the upper quaternary deposits are also carbonated with a solid content of up to 400 mg/l.

The ground waters in the southern central area of the country contain large quantities of nitrates of geological origin. To the north of the central part of the country iodine is to be found in the ground waters. Ground waters in the north-western part of the country contain a considerable quantity of fluorine, though, in a number of other parts of the country, the ground-water fluorine content is lower than 0.1 mg/l.

Bulgaria

The chemical content of the underground waters varies considerably, as the following tabulation shows:

Hardness	6°-35°
Salts	400-1100 mg/l
Iron	Slight traces to 1.5 mg/l; usually not more than 0.1 mg/l.
Manganese	Traces to 2 mg/l; more frequently less than 0.1 mg/l.
Nitrites	In drinking-water, 0 to less than 0.1 mg/l.
Nitrates	2-10 mg/l.
Fluorine	0.3-1.5 mg/l, and even, in isolated cases, as much as 5 mg/l.
Sulfates	In some waters up to 300 mg/l and more (geological origin).

. . . Experience here has brought to light a number of cases requiring attention because of infiltration of pollutants into ground waters. In brief, ground waters in the villages inevitably become polluted from the surface if they lie at a depth of less than 2 m. Such pollution is unavoidable, even where there are no permeable cesspools.

Abstract (continued)

If the ground water lies at a depth of more than 2 m it may escape pollution from the surface if covered by dense clays or fine-grained soils of mixed sand and clay. With coarse-grained soil, surface pollution infiltrates up to a depth of 15 m.

Poland

The chemical composition of the ground waters in different parts of the country and in different geological conditions can be summed up as follows:

Hardness	1°- 50°
Salts	100 - 1000 mg/l
Iron	0 - 10 mg/l
Nitrates	0 - 30 mg/l
Manganese	0 - 2 mg/l
Chlorides	5 - 400 mg/l
Fluorine	0.1 - 0.5 mg/l

Romania

Some 98%-99% of the rural population use ground water from springs and wells (about 800,000 wells). Ground waters as a rule are not used for irrigation. In most cases their chemical composition satisfies generally accepted standards of hygiene. In certain districts . . . the ground waters have a high degree of hardness amounting to over 20° (German hardness). . . . . . . there are ground waters with an iron and manganese content of over 0.5 mg/l. . . . . . .ground waters have a high content in sulfates (400-1000 mg/l) and chlorides (20-40 mg/l). The fluorine in underground waters is usually less than 1 mg/l except in three districts, where its content is over 1 mg/l. . . .

Disease/Solid Waste Abstracts

No. DSW- 749

Author Statement by:
Wesley E. Gilbertson, Chief, Office of Solid

Title Wastes, Public Health Service
before the Subcommittee on Science, Research
and Development of the

Reference House Committee on Science and Astronautics

Doc. No.	**Contract No.**	**Date issued**
		July 21, 1966

Abstract

The Federal Government now has under way a national program to advance the technology of solid waste management under the Solid Waste Disposal Act. . . .

The solid wastes problem reached major proportions during many years of public indifference. . . . Although huge amounts of public funds were spent for waste collection and disposal, little public or private money was invested in those years of indifference in solid waste research . . .

Because of the lack of research and development, solid waste disposal methods common throughout the United States today represent little advancement beyond the technology of the garbage pail, the trash can, the open dump, and the obsolete incinerator. The technological void which the national program was devised to fill is truly great. We must be prepared for a long-term effort to fill it.

. . . more than 20 human diseases are carried by rats and insects proliferating in tens of thousands of open dumps. . . . . . . solid waste contamination of the land usually results in health-threatening air and water contamination. Gross pollution of water is produced by open dumps or improperly designed and operated landfills. Open burning or inefficient incineration of solid wastes are major causes of air pollution in many cities.

. . . Air, water, and land are reservoirs, . . . interconnected and interrelated. To pollute one may be to pollute all three. . . .

. . . the physical burden of solid wastes is increasing annually more rapidly than the population, and we are generating more of the kinds of materials which are particularly difficult to return safely to the air, water, and land.

. . . progressive effectiveness in removing harmful pollutants from waste streams leading to the air or to the water must and does involve diverting these pollutants to the solid waste stream. . . .

Descriptors

processes
solid waste management
Solid Waste Disposal Act
legislation
health hazards
scenic disfigurement
diseases
program planning
long-range management
development
criteria
surveys

Abstract (continued)

. . . the Solid Waste Disposal Act . . .

. . . gives much needed emphases to the urgency of developing technologies which will make it possible to reduce the generation of wastes at the source, to recycle them back into production, to increase the salvage of useful materials, and to either use or convert into useful materials far more wastes than are used or converted today.

. . . Fragmentation of waste disposal responsibilities among small political subdivisions, sometimes running to several score in a single county, is common throughout the country and a major reason for technological backwardness in solid wastes management.

. . . the national solid wastes program has been gotten under way in all five of the major areas of activity projected by Congress.

Statewide solid waste program planning is now getting under way in 14 States under grants covering up to 50 percent of the cost of the work. . . .

. . . goals must be translated into solid waste management criteria which can be used as guides by State and local governments for the adoption and enforcement of standards, and by industry for the development of equipment and techniques capable of meeting such standards. . . .

A national picture of the current status of solid waste management problems and practices is patently needed at this time. . . .

To reduce waste production at the source, it also seems clear that research resources ought to be devoted to the design of products which generate less waste. . . . . . The packaging industry has an opportunity to make a dramatic contribution to solution of the waste management problem.

. . . solid waste salvage not only reduces the physical burden of them, but adds to the Nation's resources.

Recovering heat from solid waste incineration has tremendous possibilities . . .

. . . carbon from conversion of solid wastes might be used to filter from water certain pollutants, . . .

. . . reclaimed land becomes valuable for golf courses and other recreational areas and adjacent property values are increased markedly. . . .

. . . composting is regarded as a promising route to solid waste disposal. . . .

. . . we want to satisfy ourselves that composting will be acceptable from the standpoint of human health protection.

Solid wastes technology needs improvement in . . . collection. . . .

. . . solid waste management is an extraordinarily complex problem. . . .

. . . a technology of decision-making . . . which should have great usefulness . . . is . . . systems analysis, . . .

We have been seeking assistance in adapting systems analysis techniques to solid wastes systems development. . . .

. . . Industry experience with aero-space technology might well be used in the development of waste recycling systems, . . .

. . . The final steps for abating solid waste pollution will have to be taken by the people in their villages and cities, their counties and States. . . .

Disease/Solid Waste
Abstracts

No. DSW- 750

Author

Heather M. David

Title

House Space Committee Urges Systems Approach to Pollution

Reference

Technology Week, p. 20

Doc. No.	Contract No.	Date issued
		October 31, 1966

Abstract

Washington - Opportunities for applying technology to the cure of pollution problems have been outlined by the House Science and Astronautics Committee after an extensive study spanning the last year and one half.

The best research steategy, the committee feels, should include the systems analysis and management approach which has proved useful in other large, complex technological programs.

Some of the technological programs the committee suggested include:

—Baseline measurements in plant and animal communities - an ecological survey.

—Continued monitoring of changes in the biosphere,

—Development of abilities to predict the consequences of man-made changes.

—Early detection of such consequences.

—Knowledge of the environmental determinants of disease.

. . . The cost of catching up in pollution abatement and keeping waste management up to date will be $100 billion over the next 10 to 20 years, . . . As much as a half a billion a year could be commanded for supporting science and engineering, it was suggested.

. . . The committee also notes that $150-$300 million per year should be invested in solid-waste research and development per year.

Demonstration is an important part of the attack on pollution. . . .

A great opportunity was cited for transfer of skills from other areas of activity, such as the aerospace industry. In addition to systems analysis, there is opportunity for application of all the basic disciplines. . . .

A large market also exists for the instrumentation makers, ... instrumental methods must be developed to replace present sujective techniques.

Descriptors

pollution
House Science and Astronautics Committee
research
systems analysis
ecological survey
monitoring
environmental determinants of disease
air pollution
solid-waste research
Federal role

Disease/Solid Waste
Abstracts

No. DSW- 751

Author

University of Michigan

Title

Occupational Diseases, Acquired from Animals

Reference

124th Institute . . .

Doc. No.	Contract No.	Date issued
		Jan. 7-9, 1964

Abstract

This is a compilation of papers given at the Institute on Occupational Diseases Acquired from Animals, January 7-9, 1964, University of Michigan. General titles are:

Viral & Reckettsial Diseases
Fungal Diseases
Bacterial Diseases
Protozoal & Helminthic Diseases
Occupational Health Practices

Typical subtopical material on the individual diseases treats of etiology, epidemiology, hazard to man and control. There are extensive bibliographies. The roll of the practitioners of medical science is discussed. Some projections and recommendations for research are presented.

Descriptors

viruses
rickettsia
fungi
bacteria
protozoa
helminths
disease
occupation

health
research
epidemiology
zoonoses
prevention
animal diseases
occupational medicine
control
vectors

Disease/Solid Waste
Abstracts

No. DSW- 752

Author

R.H. Foote & D.R. Cook

Title

Mosquitoes of Medical Importance

Reference Agricultural Handbood #152
Agric. Research Service, U.S. Dept. Agric. 195

Doc. No.	**Contract No.**	**Date issued**

Supt. Doc., U.S. Printing Off., Washington, D.C.

Abstract

Mosquito-transmitted diseases are briefly discussed (4 pp.) Geographical distribution and relative medical importance of disease-transmitting mosquitoes, based on pictorial keys" covers pp. 5-106. Notes on the medically important species "cover pp. 107-143. Aedes, Anopheles, Culex, Haemagogus, Mansonia and Sabethes species are discussed in this section. Each species is discussed under the headings "Bionomics", "Relation to Disease" and "Recorded Distribution". Numerous illustrations for purposes of identification are given.

Descriptors

mosquitoes
disease
malaria
dengue
yellow fever
encephalitides
filariasis
distribution
specis
bionomics

Disease/Solid Waste
Abstracts

No. DSW- 753

Author

World Health Organization

Title

Vector Control

Reference

W.H.O. Bulletin

Doc. No.	Contract No.	Date issued
Supplement to Vol. 29, 1963		

Abstract

This excellent series of papers is taken from a WHO seminar held in Geneva, 5-9 November 1962. Representatives titles are, "Vector-borne Diseases in Man: a General Review"; "Arthropod Vectors of Public Health Importance"; "Rodents in Relation to Problems of Arthropod Diseases"; "Research in Vector Control"; "Prospects for Vector Control through Sterilization Procedures"; "The Use of Attractants and Repellants in Vector Control"; "Ecology and Vector Control"; "The Urban Mosquito Hazard Today"; Ecology and Integrated Control Procedures", etc.

Descriptors

- vectors
- insects
- arthropods
- disease
- mosquitoes
- fleas
- flies
- rodents
- ecology
- epidemiology
- control
- pests
- research
- sterilization
- parasites
- attractants
- repellants
- plague
- education

Disease/Solid Waste Abstracts

No. DSW- 754

Author

Don L. Warner

Title

Deep-well Disposal of Industrial Wastes

Reference

Chemical Engineering

Doc. No.	Contract No.	Date issued
		Jan. 4, 1965

Abstract

Deep-well injection is not actually a disposal method but rather a storage method. If a deep-well injection program is properly planned and implemented, the wastes introduced into an underground stratum will remain there indefinitely, with little danger to potable water or other natural resources.

. . . the planning construction and operation of an injection well requires the services of qualified geologists or petroleum engineers, as well as consultation with the appropriate water pollution control and resource agencies.

The suitability of a possible injection-well site depends on subsurface geologic considerations. . . .

Since the injection of liquid wastes into subsurface rock strata constitutes the use of limited storage space, only concentrated toxic relatively untreatable wastes should be considered. In addition, these wastes must be physically and chemically suitable for deep-well injection.

. . . the volume of waste is important because the daily intake rate of a well is limited, and its operating life depends on the cumulative volume of injected fluid.

Experience with injection wells indicates that the intake rate can vary widely. . . .

The intake rate and operating life of an injection well can be estimated from equations developed by hydrologists[1] and petroleum engineers[2,3] . . .

Injection wells should be monitored to detect: (1) failure of the well casing or cement, (2) escape of waste through fractured or faulted cap rocks or through other abandoned or operating wells, and (3) loss of permeability in the injection horizon during operation. . . .

Descriptors

suitability
economics
regulations
wells
petroleum industry
wastes
deep-well injection
water
sites
industrial waste
geologic considerations

liquid wastes
toxic wastes
volume of waste
hydrologists
petroleum engineers
cost
drilling
evaluation
monitoring
ground-water

Abstract continued

References:

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24. Muskat, Morris, "The Flow of Homogeneous Fluids Through Porous Media", McGraw-Hill, New York (1946)

25. Muskat, Morris, "Physical Principles of Oil Production", McGraw-Hill, New York (1949)